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# Hardness



of nitrided articles for technical purposes. Systematic research into the industrial measurement of such hardness was ordinarily confined to available laboratory equipment without any endeavor to correlate experimental data of the various sources. The present article is intended to compare some of the work of various investigators with a vast amount of data taken from the writer's own determinations.

## Fundamentals of Testing the Hardness of Nitrided Steels

Before delving into the much discussed problem of practical methods for testing the hardness of nitrided surfaces, it is of value to survey the microscopic characteristics of the process involving the thermo-diffusion of nitrogen into the ferrous matter. The microstructure as well as chemical analyses of samples taken equidistantly from the surface toward the center or core reveals the perhaps little comprehended fact that the concentration of nitrogen or nitrides decreases toward the interior of the nitrided specimen in accordance with a definite mathematically expressible law. It is only natural to assume that the physical properties will be derivatives of these microstructural changes. This somewhat hypothetical assertion finds strong support in experimentally established changes of hardness, as may be noted when testing the hardness gradient between the surface and core of nitrided specimens. Fig. 2 indicates a series of Vickers tests made on a sample of nitralloy, treated at 960 to 980 deg. F. for 60 hr. and having a case of approximately 0.025 in. The microstructural changes for a similar surface section are given directly below the hardness diagram. The importance of these hardness curves is



ANY attempt to discuss intelligently such a known and appreciated metallurgical phenomenon as the surface hardness of nitrided steels must essentially commence with the earliest recognition of this important property. Unbiased studies of available reports on those fundamental discoveries pertaining to the nitriding process prove the somewhat oddly appearing contention that history has been very unkind in this respect to American metallurgy. It certainly should be borne in mind that almost two decades before the more or less legendary introduction of nitriding as a surface hardening process to the metal industries by German metallurgists, a United States patent had been issued to A. W. Machlet (U. S. Pat. No. 881,181 and, in 1914, No. 1,092,925) covering the hardening

of ferrous metals by means of ammonia gas, either alone or in conjunction with carburizing gas. Claims set forth in both patents disclose Machlet's intimate knowledge of the facts, that "... the surface is practically proof against rust," "... it is difficult or impossible to anneal said silvery casing," etc. In respect to hardness Machlet observed that nitrided cases or "... said silvery casing is harder than tool steel..." When realizing that up to 1905—the year of Machlet's first patent—hardness testing as well as metallography were still in their infancy, the originality of Machlet's discovery must be acknowledged in preference to any German or other claims.

Irrespective of this historical controversy, there remains little doubt as to the predominant importance of mechanical hardness



# Testing of Nitrided Steels

By JOHN H. HRUSKA  
*Metallurgical Engineer, Berwyn, Ill.*

steadily growing, for which reason nearly every outstanding paper on some phase of modern nitriding is being illustrated by graphical representations of this hardness gradient, i.e., of the difference between case and core hardness of typical nitrided specimens.

However, additional factors enter into testing the hardness of nitrided steels, which are not so easily understood as chemical composition and microstructure. Thus, for example, it has been proved by rather comprehensive experiments that in hardness testing the depth of penetration is affected by the underlying metal to a distance of about 6 to 10 times the actual depth of the impression. With this in mind, it will be realized that the depth of an impression is not only proportional to load and type of impresser, but that it is a very important criterion for the ultimate reliability of the reported hardness of nitrided stock. A comparison of the most widely used methods of hardness testing—as in Table I—will disclose quite radical variations in the depth of penetration and in the utilized testing pressures. Almost needless to add, some of these numerals or methods indicate the superficial hardness only, whereas other procedures furnish something like an average or an integrated value of the case and its supporting core. To what extent either or both alternatives are of value for production or even research work is not within the scope of this paper.

Thus having briefly accentuated some of the difficulties which must be considered in routine and more so in research hardness testing of nitrided steels, it is proposed to deal with those methods of testing this valuable property which have been used successfully in connec-

tion with some hardness problem pertaining to nitrided steels.

## Scratch Testing for Hardness

The successful application of most scratch methods of hardness testing still depends a great deal on the manual dexterity of the operator. The type and construction of the testing equipment add similarly to the reliability of such tests. In principle, scratch methods of hardness testing may be divided according to the number of scratching or cutting points, viz. single or multiple scratch tests. The simplest test of the first group is represented by the old Moh scale. Due to the practical impossibility of distinguishing variations of hardness to any marked degree the Moh test is practically out of consideration for any commercial purposes. It is of still less value for scientific purposes pertaining to the nitriding process. In order to enhance the usefulness of the Moh test, at least for some industrial comparisons, several technicians of the Norton Co. have added five degrees to the conventional 10-point scale.

Probably the first theoretically sound application of a simple point scratch for the testing of nitrided steels was tried by G. M. Eaton, who suggested the sclerometer as a means to evaluate the surface hardness. A very comprehensive study using a diamond scratch for this purpose was published by C. H. Bierbaum in 1930. Bierbaum obtained scratches or "microcuts"—with a diamond point and under a load of 9 gm.—ranging from 1.84 to about 2.39 microns in width. The most accurate optical equipment is absolutely essential in carrying out such precise measurements of the width of microcuts. This requirement and the necessity of a micro-polish of the tested

specimens render the Bierbaum and sclerometric tests somewhat tedious and costly for production control. Strict laboratory or research work may occasionally benefit from data secured by utilizing either procedure.

The multiple scratch, as exemplified by the ordinary file test, seems to furnish qualitative information to some nitriding or consumers' plants. However, any part of an industrial file used once for the testing of a properly nitrided surface is absolutely unsuitable for another test and must be changed for a new one if further testing is to be done. In addition, file testing depends to a considerable extent on the operator's skill and naturally also depends on the hardness of the file, which property varies more than is generally realized. Since the introduction of speedier and much more reliable hardness testing methods, file tests are rapidly being abandoned in their favor. Today, the file is almost obsolete as a tool for testing hardness of superhard metals.

In even the earliest attempts to measure the hardness of nitrided ferrous metals, the Brinell ball test received some consideration. The inconsistent and erroneous results obtained during these trials convinced the investigators that even very carefully made Brinell hardness tests made by means of a 10-mm. steel ball with a load of 3000 kg. or 500 kg. are practically meaningless as indices of relative hardness. The explanation for this apparent discrepancy lies in two directions, namely (1) the case of commercially nitrided steel is too thin to support a load of three tons or half a ton without being pressed into the underlying core of much lower hardness, and (2) even if a

(CONTINUED ON PAGE 26)

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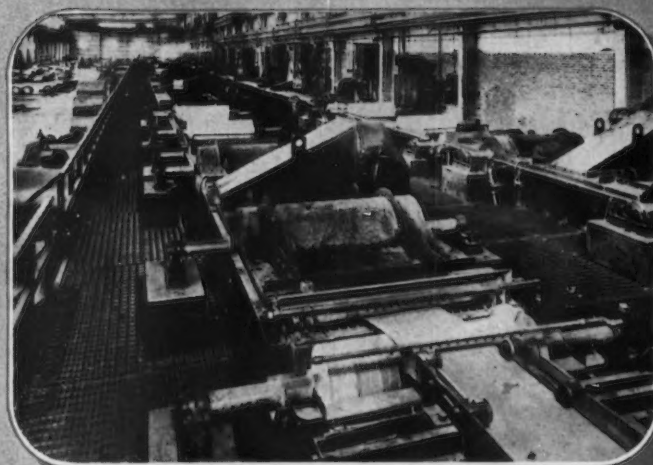
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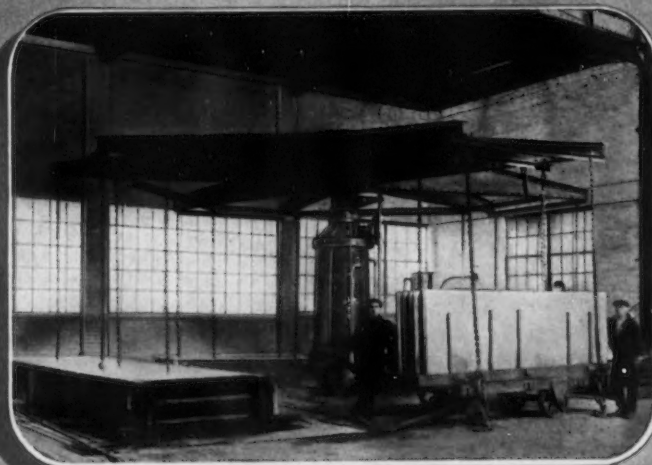
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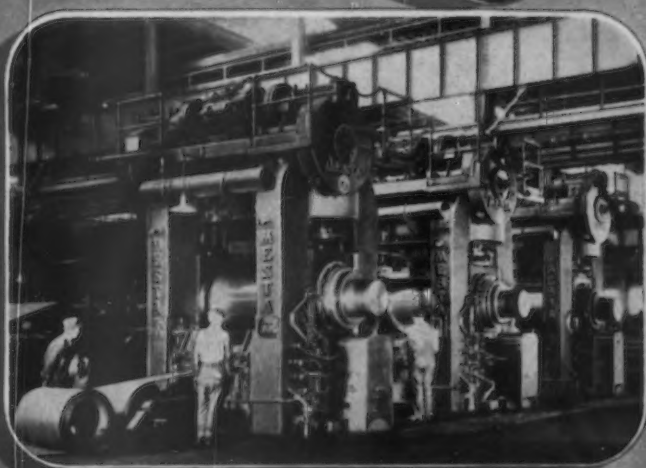
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(CONTINUED FROM PAGE 23)

satisfactory Brinell test pressure could be maintained by the nitrided case, it must be remembered that the hardness of the tested surface exceeds considerably that of the used steel ball, which fact is contrary to normal testing conditions.

Brinell tests do give useful information pertaining to the quality of nitrided surfaces. Research work by A. B. Kinzel, John J. Egan and Walter Crafts proved conclusively that ductile and brittle cases may be differentiated by careful examination of the edges or immediate vicinity of Brinell impressions made by means of 10-mm. steel balls under a load of 500 kg. The discovery of concentric or radial cracks noticeable already at magnifications of 10 to 20 diameters are considered positive proof of eventual spalling of the nitrided case when used under appreciable pressure. The absence of such defects, together with a somewhat blurred edge of the Brinell impression, indicates a so-called "tough case."

The above procedure, as described originally by Kinzel and Egan, was the first one on record as a practical method of ascertaining case ductility. In justice to other instruments of the indentation type, similar results are now obtainable also by means of the hardness testers of Vickers, Rockwell, Shore, Monotron and other machines.

When discussing the Brinell test as a practically disregarded test for measuring the hardness of nitrided cases, it is nevertheless interesting to note that the numerical hardness of nitrided articles is predominantly expressed in Brinell units, although the determination may have been conducted on a Vickers, Monotron or other apparatus. Convenience and better

technical understanding have dictated this conversion. To indicate that the resulting numerals are conversions and not original Brinell tests the more accurate hardness testing laboratories express such numbers as "Vickers-Brinell," or "Monotron-Brinell" numerals.

#### Low Pressure Used in Rockwell Test

The fallacy of using the standard Brinell machine for conducting hardness tests of nitrided steel directed several investigators toward indentation methods applying smaller loads and smaller indenters. The use of the Rockwell apparatus was a logical attempt. When carrying out this test with a 120-deg. diamond cone and a pressure of 150 kg., the readings obtained vary approximately from C-65 to C-68, i. e., just about the same as when testing water-hardened tool steel. And yet, nitrided edges easily scratch the best hardened tool steel. It was readily understood that the applied pressure was still too great. Tests with 100 kg. and with the standard brale (diamond cone) were similarly disappointing.

Later, R. Sergeson commenced to take Rockwell readings under "no load" conditions, which term may be better expressed by "no weight," since the cone was still under a pressure of 60 kg. This alternative gave good information when the thickness of the nitrided case was sufficiently ample (from about 0.025 in. up). Sergeson's work seems to indicate that a pressure of 60 kg. is just about the upper load limit for testing commercial stock. Heavy cases give logical readings, whereas thin cases invariably show the effects of the softer core. This discrepancy has since been eliminated by the manufacturers of the Rockwell

hardness tester—apparently following a printed suggestion by G. M. Eaton—who have developed the so-called "Superficial Rockwell" hardness testing machine. The applicable loads of the new device are 15, 30 and 45 kg. With this specialized Rockwell apparatus the hardness of nitrided articles may now be tested with great accuracy. All three pressures seem to give consistently reproducible readings, the 30-kg. load having perhaps been adopted by most metallurgists as the preferential pressure for nearly all commercial stock. The limiting values and a few actual determinations made by the author on nitrided pieces picked at random in a large nitriding plant gave the tabulation in Table II.

A graphical representation of the relationship of Rockwell hardness numerals as determined by the various modifications of the superficial and standard Rockwell machines is shown in Fig. 3. The values used in compiling this diagram were secured only from tests made on nitrided steels of several sources and sizes respectively. Some slight variations must naturally be expected when using this conversion for other testing machines or other stock.

For some years there has been growing recognition of the need for a hardness testing machine which would measure the load required to produce an impression of constant size. One of the initial steps in this direction was made by the introduction of the Monotron machine by A. F. Shore. The claimed advantage of the Monotron, that is the possibility of applying small working pressures and of reading them simultaneously at minute depths of indentation, suggested the utilization of the Monotron for measuring the changes of hardness

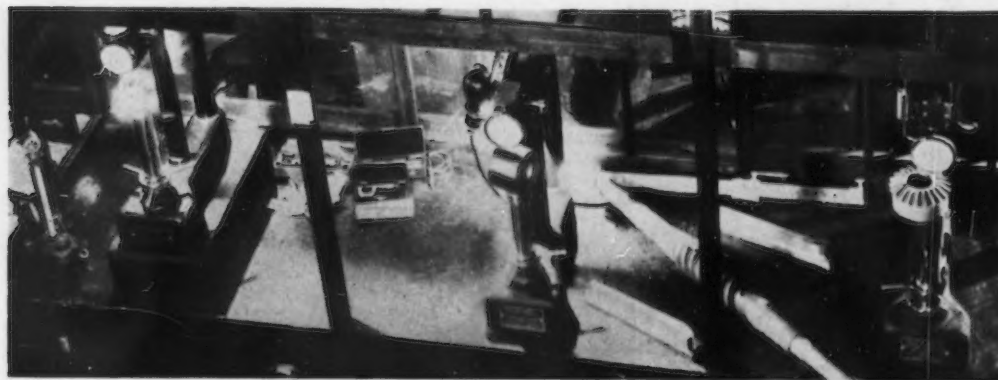


FIG. 1—Hardness testing equipment in a modern nitriding plant. Photo by courtesy of Lindberg Steel Treating Co., Chicago.



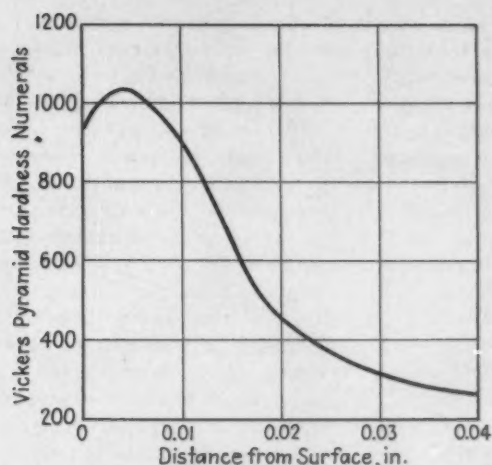


FIG. 2—Graphical representation of the hardness gradient and corresponding microstructure of nitrided steel.

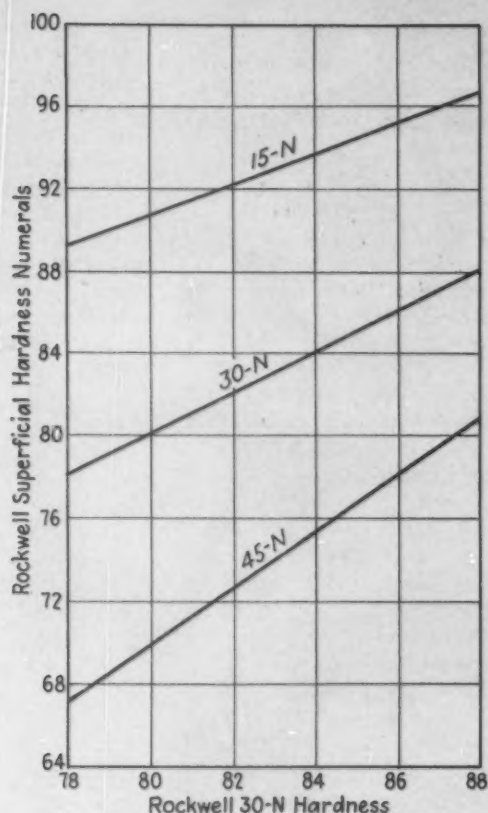


FIG. 3—Conversion curves for 15N (upper curve), 30N (center curve) and 45N (lower curve) Rockwell superficial hardness tests of nitrided steels.

with varying depth from the surface of nitrided steels. The Shore Monotron is particularly interesting to adherents of the conventional Brinell test as it uses a 0.75-mm. hemispherical diamond ball as indenter. When making a standard Monotron test the instrument measures the pressure essential to produce a depth of the spherical impression of 0.045 mm. This depth is equivalent to nine divisions on the Monotron scale, one division being 0.005 mm., or 1/5000 in. The ability of the Monotron to test hardness at multiples or even fractions of these divisions brought about serious considerations of the use of this apparatus for determination of depth-hardness characteristics of nitrided steels. Carefully treated samples will disclose within the nitrided case a linear relationship between the load and the depth of penetration. In such instances accurate readings are obtained by penetrating merely to a depth corresponding to three divisions or 0.015 mm. and by multiplying the resulting figure by 3, which gives directly the standard Monotron hardness number. This procedure serves as a precautionary measure against possible damage of the

diamond indenter. Such fractional penetration in nitrided cases is produced by pressures from 34 to 43 kg., which range is somewhat above the maximum load for either the Rockwell superficial or the Vickers hardness testers. The hardness limits for commercially nitrided steels would be in terms of the standard Monotron scale from 102 to 129 kg. or 948 to 1196 Diamond Brinell.

In scrutinizing the various results obtained by the Monotron, it is surprising to observe that the softer "skin" often noted on taper-ground nitrided samples may not be detected by means of the ordinary method of making depth-hardness tests. In spite of these and additional criticisms by some authors as to the sensitivity of the Monotron for examinations of nitrided surfaces, it is the general consensus that quick and technically accurate determinations of the hardness range may conveniently be made by the Monotron.

#### Vickers Test in Favor

Judging from printed evidence at command as well as from various written and verbal discussions on the subject of testing the com-

parative hardness of nitrided specimens, the Vickers test is generally accepted as the one most suitable for studying the surface hardness of nitrided steels. The superiority of this method or apparatus respectively is based on the principle that Vickers hardness tests consist of measuring microscopically the diagonal length of an impression made by a square-based truncated diamond pyramid having a face angle of 136 deg., which indenter is under a load of 5, 10, 20 or 30 kg. The diagonal is eight to 16 times as long as the corresponding depth of penetration, which fact alone may account for the accuracy of determinations made by the Vickers method. As has been mentioned in the introductory remarks, the depth of Vickers impressions is very small, thus making the measurement of the diagonal instead of the depth highly desirable. The "diamond pyramid hardness numeral," or for short "the Vickers hardness," is reported as the quotient of the selected load in kilograms by the pyramidal area in square millimeters. The load employed in making the test shall be stated in every report. The British Standard No. 427-1931 (the Vickers originates

in Great Britain) specifies the following method of indicating Vickers hardness:  $HD/load$  in  $kg. = \dots$  (for example  $HD/10 = 1206$ ). Vickers readings are readily converted into Brinell numbers, thus enabling the less specialized engineers to comprehend the numerical hardness, especially of nitrided articles in comparison with other materials. As a more or less standardized method the Vickers

requirements with the same precision as the costly Vickers. These "home-made" machines are mostly of the direct-loading type, the indenter being an exact replica of the original 136-deg. four-sided pyramid by Vickers. The dimensions of the indentation produced are obtained by means of a metallurgical microscope of the Sauveur type equipped preferably with a filar micrometer, the graduations

of competitive machines. For testing nitrided work a Vickers pyramid is pressed into the examined surface by a load of either 10 or 30 kg. The minute impression is then measured by a microscope and the resulting diagonal length expressed in either Vickers or Brinell numerals. Determinations by the Firth Hardometer are of the same magnitude as those of the Vickers provided the same care is being exercised in making the readings. While the impresser and microscope of the Firth machine are mounted on a substantial pillar at a 90-deg. angle, a testing apparatus has recently been perfected by Pomey and Voulet of France which has the loading device as well as the microscope supported by the same stand. This machine is illustrated in Fig. 4. The impression is first made with a Vickers diamond pyramid under a load of only 1 to 4 kg. The impresser is then removed from the stand and a measuring microscope brought into the same place and same axis to determine the diagonal length of the impression. Although the Pomey-Voulet hardness tester was originally designed as a laboratory instrument, it has found use also for more precise shop tests relative to nitrided steels. The hardness numerals obviously may be those of Vickers or they may be converted to Brinell values. For direct Brinell values the instrument may have semi-spherical diamond indenters; the Brinell numbers are then calculated similarly as in all ball tests.

#### Pendulum Tests Very Accurate

The well-known sensitivity of pendulum hardness testers considerably exceeds that of many other conventional methods based on some dimensional characteristics of indentations left by variously shaped impressers. The inaccuracy associated with indentation methods—especially when testing super-hard substances—are eliminated by pendulum tests because no attempt is being made to measure geometrical configurations of the resulting impressions. The very light pressures (scarcely exceeding 4 kg.) render pendulum tests practical surface tests. This statement concurs with the opinions of many investigators, who also agree on the contention that the pendulum test is probably the

(CONTINUED ON PAGE 30)



FIG. 4—The Pomey-Voulet hardness testing apparatus. Photo by courtesy of Acieries et Forges de Firminy, Loire, France.

test is at present the most effective combination of a fairly rapid and precise shop test or, by applying special precautions in carrying out the test, it serves admirably well as a precision tool for fundamental research. It should be emphasized, however, that the latter alternative necessitates a microscopic polish of the investigated specimens.

While it is true that a great amount of research was based on hardness tests made by the original Vickers machine, the author is aware of the equally appreciated fact that improvised equipment often fulfilled the most exacting

of which are calibrated against a standard micrometric scale. Important research work has been carried out by means of this method with entirely satisfactory results in regard to accuracy and duplicability. For routine testing, however, the original Vickers has naturally many advantages over such auxiliary methods.

The unduly high price of the Vickers hardness testing machine has prompted several successful attempts to develop cheaper and much smaller apparatus of the identical load-indentation characteristics as the Vickers. The Firth Hardometer belongs in this group





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most accurate means of determining the actual hardness and hardness variations of nitrided cases.

There exist several modifications of pendulum hardness testing devices, of which the Herbert Pendulum is without doubt the one most widely used. This apparatus consists, in principle, of a 4-kg. pendulum casting, calibrated by several set screws, and balancing on a 1-mm. ball. For testing nitrided steels this ball is made of well-selected diamonds. The adjustments are in such a direction that the instrument or the distance between its center of gravity and the point of contact represents a compound pendulum of having length of 0.1 mm. The standard test or "Herbert time hardness number" consists in ascertaining the duration in seconds consumed by 10 complete single swings of the pendulums put out of mechanical equilibrium by a gentle push. The active length of the compound pendulum is so adjusted as to require exactly 100 sec. on polished plate glass. Ten swings on nitrided steel require about 68 to 78 sec. An additional advantage of the Herbert Pendulum is its ability to test hot-hardness, i. e., the actual

Table I  
Depth of Penetration when Testing the Hardness of Nitrided Steels  
by Various Methods

Type of Test	Indenter	Load Applied	Hardness Numeral	Total Depth of Penetration	
				In.	Mm.
Brinell	10 mm. steel ball	500 kg.	248	0.0032	0.081
Monotron	0.75 mm. diameter ball	114 kg.	114	0.0018	0.045
		(38 kg.)	114	0.0006	0.015
Rockwell, standard	120 deg. diamond cone	60 kg.	72.6	0.0012	0.031
Rockwell, superficial	120 deg. diamond cone	45 kg.	75.6	0.0010	0.026
		30 kg.	82.8	0.0007	0.018
		15 kg.	93.2	0.00037	0.009
Vickers	136 deg. diamond pyramid	10 kg.	1,064	0.00075	0.019
Herbert Pendulum	1 mm. diamond ball	4 kg.	...	0.00011	0.003
Microcharacter	Diamond cube	9 gm.	2,950	0.00006	0.0014

hardness while the tested sample is at a higher temperature. Exceptional care must naturally be taken as not to damage the diamond ball of the tester. Some of the observations made when testing the hot-hardness of nitrided steel shall be summarized in the concluding paragraph of this article.

A few years ago another pendulum tester was invented by the French metallurgist, Professor Le Rolland. This test is principally a comparison of the coincidences

of two pendulums, of which one is a control pendulum with an exactly known period of oscillation, whereas the other pendulum is slowly swinging over its diamond ball resting on the specimen to be tested. Since the time interval separating two coincidences of the pendulums is inversely proportional to the diameter of the contact area between sample and diamond ball, the hardness may be determined by indirect measurement of that contact area. Unlike other devices

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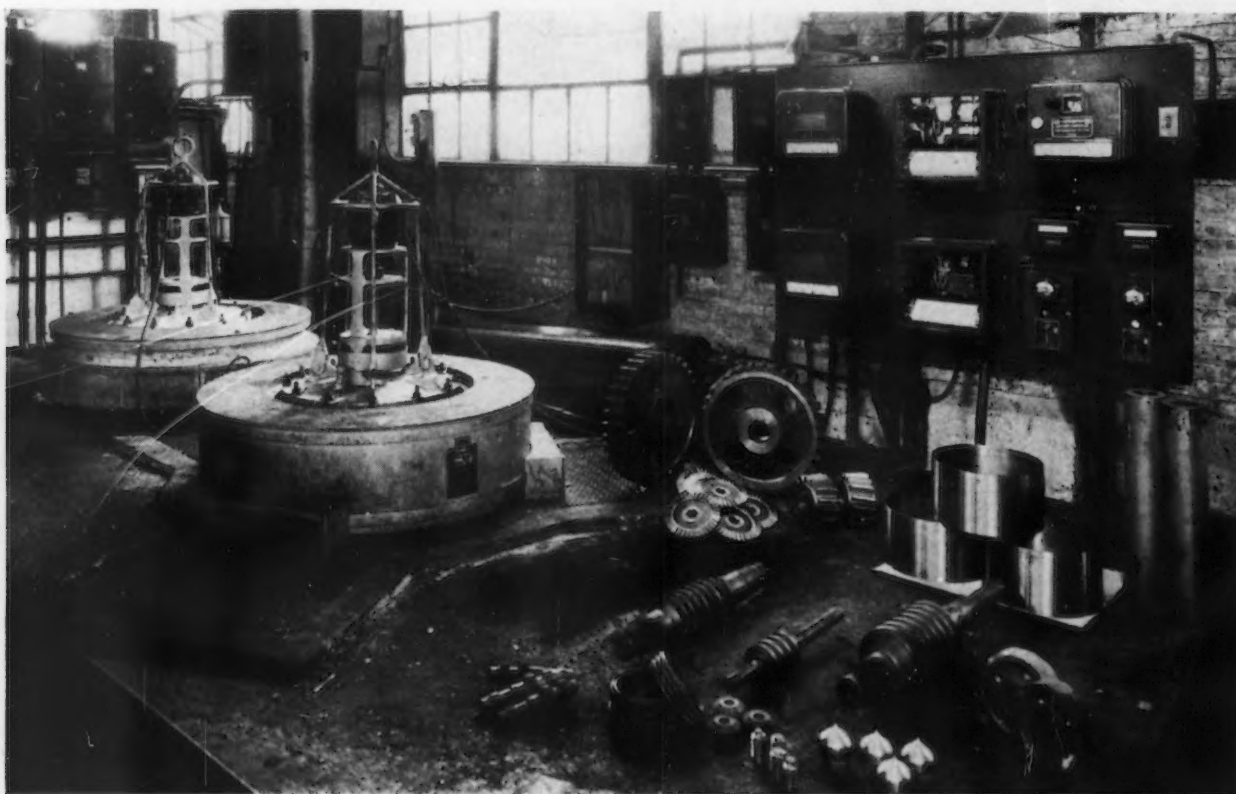


FIG. 5—Electrically heated retort furnaces for commercial nitriding. Photo by courtesy of Lindberg Steel Treating Co., Chicago.



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Chromium Nickel Alloy Steels (Stainless Steels), coming within the chemical analyses of the patents mentioned above, must be purchased from our licensees for protection against claims for infringement for use as, or for the further fabrication of, ARTICLES WHICH REQUIRE HIGH RESISTANCE AGAINST CORROSION AND OBJECTS HAVING GREAT STRENGTH AND GREAT RESISTANCE AGAINST THE ACTION OF ACIDS.

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**654 MADISON AVENUE, NEW YORK, N. Y.**

*Francis P. Garvan, President*

# SPARK T

## Characteristics of Imp



S.A.E. 1015 (C 0.14, Mn 0.47)

• • •



S.A.E. 1020 (C 0.21, Mn 0.49)



S.A.E. 1030 (C 0.32, Mn 0.72)

A DEFINITE knowledge of the spark-stream characteristics of the steels is of prime importance for practical application of spark testing. The following prints, combined with additional pictures to appear in *THE IRON AGE* of Oct. 3, show a series of 28 spark tests and characteristics of better known S.A.E. grades of carbon and alloy steels. These pictures are the result of a special study that has proved this method to be an accurate and a dependable procedure. Spark testing is an extremely economical procedure for sorting mixed grades of steel and also finds extensive use in preventing various grades from becoming mixed. However, it must be understood that practice and skill are essential to success.

The practical working equipment consists of a small enclosed space from which most of the light can be excluded, colored glasses for the operator and a small electric grinder equipped with a 1½ in. by ½ in. by ¼ in. carbo-emery wheel having a shaft speed of from 13,000 to 15,000 r.p.m. For spark testing in the plant a light weight portable grinder, colored glasses for the operator, and a hood to assure semi-darkness should be provided. The sample being tested is preferably ground on the end with *only*



# TESTING

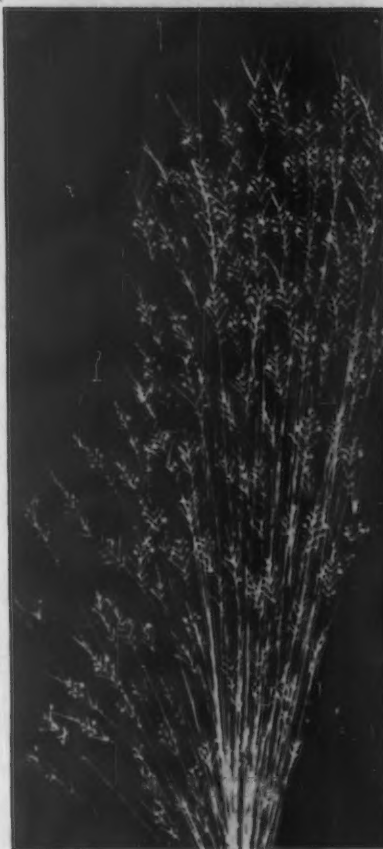
## Important S.A.E. Steels

enough pressure to assure a steady stream of sparks.

When it is desired to study a new grade of steel it is necessary first to learn the chemical analysis and then diligently test that steel until its spark-stream characteristics are definitely understood and pictured.

The spark-stream of ordinary low-carbon steel of the S.A.E. 1015 type is simple. Carrier-lines are shaped like long blades of grass, golden yellow in color, at the extreme end of which are attached the fork-shaped carbon sprigs, somewhat brighter than the main carrier-line. As the carbon increases, the number of sprigs at the end of the carrier-lines increases in direct proportion. At about 0.30 per cent carbon (S.A.E. 1030) a few star-bursts begin to appear and at 0.40 per cent carbon (S.A.E. 1040) the flame becomes shorter and thinner, the color changes to a darker hue, and the star-bursts become more numerous and more brilliant. At 0.50 per cent carbon (S.A.E. 1050) there is a further increase in the number and brilliancy of star-bursts. Above 0.50 per cent carbon the color becomes still darker and star-bursts more numerous until at 0.95 per cent carbon (S.A.E. 1095) the

(CONTINUED ON PAGE 36)



S.A.E. 1040 (C 0.39, Mn 0.67)

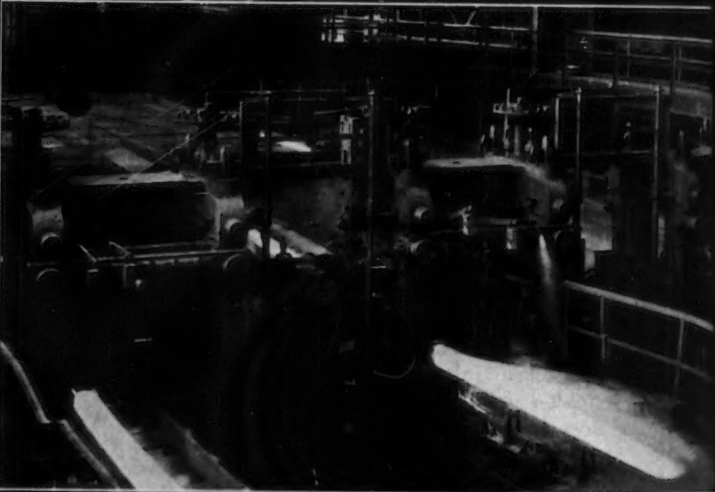
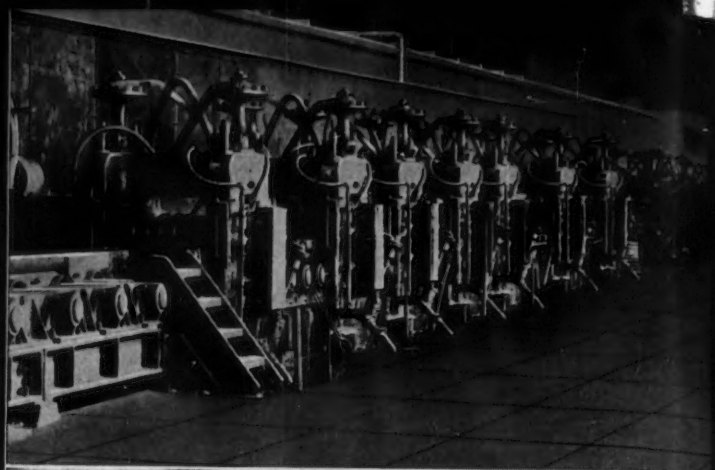


S.A.E. 1050 (C 0.48, Mn 0.66)



S.A.E. 1095 (C 1.01, Mn 0.49)

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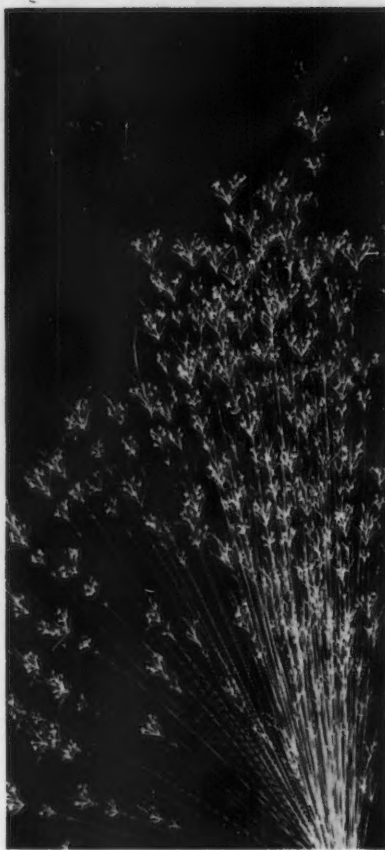
72" 4-High  
Continuous Hot  
Strip Mill

**UNITED**

ENGINEERING and FOUNDRY COMPANY  
PITTSBURGH — PENNSYLVANIA



S.A.E. X-1315 (C 0.16, Mn 1.34)



S.A.E. 1350 (C 0.51, Mn 1.10)



S.A.E. 2015 (C 0.17, Mn 0.52, Ni 0.52)



S.A.E. 2115 (C 0.17, Mn 0.42, Ni 1.48)

(CONTINUED FROM PAGE 33)

whole flame consists of a series of short, dark carrier-lines with a succession of bright star-bursts.

The quantities of manganese present in most S.A.E. steels, i.e., from 0.30 per cent to 0.80 per cent, are not revealed by the spark test. However, in the pearlitic-manganese steels (S.A.E. 1300 series) this element is clearly apparent because of its brilliancy. Its spark-stream consists of thin, radiant carrier-lines, light yellow in color, which spread out fan-wise upon leaving the wheel. The low-carbon S.A.E. X-1315 type, containing 1.25 per cent to 1.55 per cent manganese, has fork-shaped sprigs attached to the ends of the carrier-lines. The higher carbon S.A.E. 1350 type, containing 0.90 per cent to 1.20 per cent manganese, shows star-bursts quite similar to ordinary steel of the same carbon ranges.

The spark-stream of the low-carbon 0.50 per cent nickel steel of the S.A.E. 2015 type shows long, swollen carrier-lines, light orange in color, with sprigs at the end and a few bright, rectangular blocks. S.A.E. 2115 containing low carbon and 1.50 per cent nickel reveals the same effect except that the color is darker orange, rectangular blocks are more numerous and the carrier-lines are slightly heavier. In S.A.E. 2320, low carbon, 3.50 per cent nickel, the flame length increases, carrier-lines are numerous, and the spark-stream becomes darker orange in color. Also the rectangular blocks become more visible and closer together while the fork-shaped sprig indicating low carbon is apparent at the end

o o o



of each carrier-line. At about 0.30 per cent carbon (S.A.E. 2330) star-bursts begin to appear in 3.50 per cent nickel steel, although they are less brilliant than the star-bursts in other steels because nickel seems to exert a retarding influence on them. At 0.40 per cent carbon (S.A.E. 2340) the star-bursts are visible at the end of each carrier-line while along each carrier-line the rectangular blocks appear. In the low-carbon 5.00 per cent nickel grade (S.A.E. 2512 type) the predominant feature is the smaller number of carrier-lines, and for that reason the rectangular blocks typifying nickel are very apparent. The color is a very dark orange shade.

The chromium flame is generally orange, shorter than most flames, with very small stars at the end of the carrier-lines. These stars are peculiar to chromium and must not be confused with the carbon star-burst. They are distinguishable because of greater brilliance and because of slightly larger size and more nearly perfect star shape. The chromium flame appears to flutter.

Low carbon 0.60 per cent to 0.90 per cent chromium steels (S.A.E. 5120 type) reveal the sprigs of low-carbon steel with the brilliant chromium stars. As the carbon increases the flame color gradually darkens and the star bursts become more numerous.

Editors Note: Next week the spark-stream characteristics of S.A.E. steels containing nickel, chromium, molybdenum, tungsten and vanadium will be presented and discussed.

• • •



S.A.E. 2320 (C 0.16, Mn 0.41, Ni 3.48)



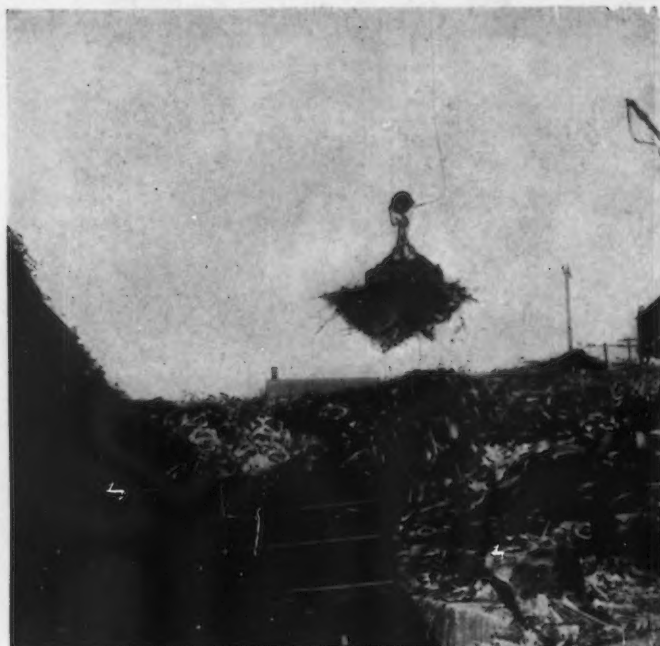
S.A.E. 2340 (C 0.42, Mn 0.69, Ni 3.47)



S.A.E. 2512 (C 0.14, Mn 0.39, Ni 4.95)



S.A.E. 5120 (C 0.21, Mn 0.43, Cr 0.82)



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- We invite you to visit our booth, No. C 23, at the Metal Congress in Chicago next month. Our exhibit will include both sound and unsound etched ingots and blooms, also the most modern methods of big-end-up ingot production.

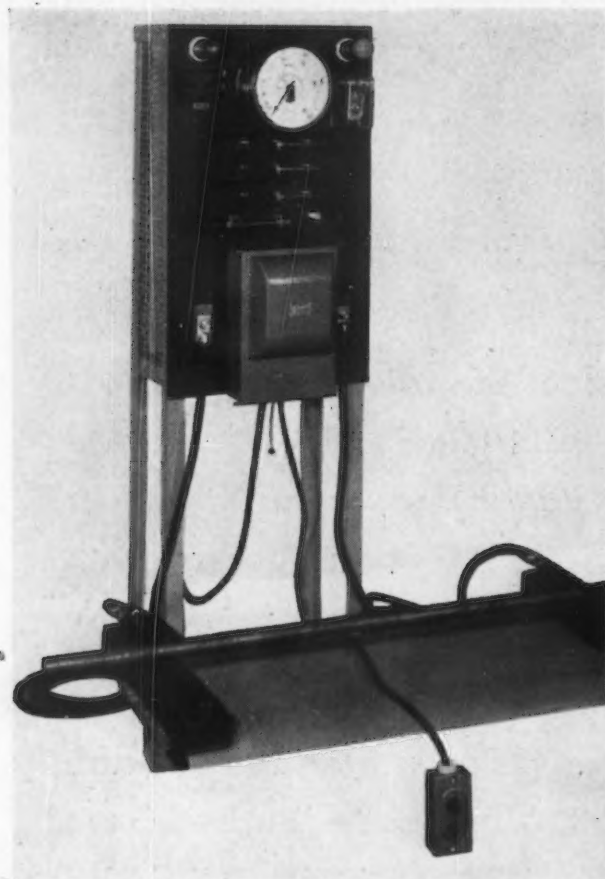


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# ... Magnaflux Inspection for

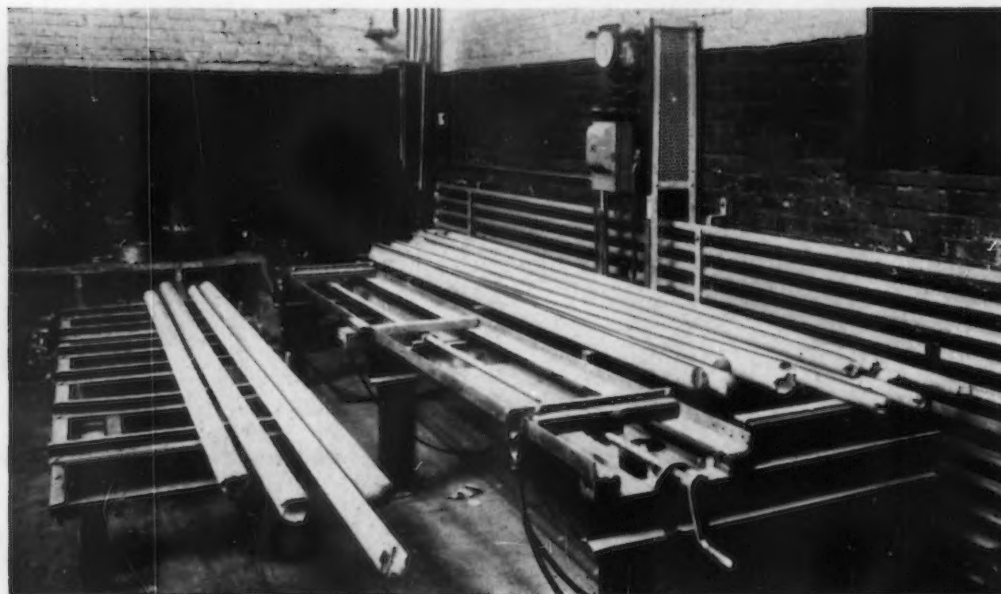


AT LEFT

FIG. 1—Type of equipment required for Magnaflux inspection of steel bars.

BELOW

FIG. 2—Magnaflux equipment installed at the Vanadium Alloys Steel Co. plant for the inspection of bar stock



THE importance of having steel parts as free as possible from seams is generally recognized. For most parts the prevailing defects follow the lines of flow and are associated with seams and pipe in the original steel. Such defects are usually most damaging at or near the surface of the part, frequently resulting in fatigue failure or even in early fractures. If parts are worked at relatively high stresses, as is the case with many carbon and alloy steels, the damage due to the presence of such defects is, of course, magnified. Occasionally cracks developing during heat-treatment may be traced directly to the presence of seams.

In searching for improved methods of locating such defects, Vanadium-Alloys Steel Co., Braeburn Alloy Steel Corp., and other manufacturers of carbon, tool steel and high-speed bars have adopted the Magnaflux method of inspection in their plants. A representative type of equipment which is used is shown in Fig. 1. This equipment operates from alternating current mains and will inspect bars, either bright or hot rolled, up to 3 in. in diameter and 14 ft.

long. The ammeter shown, having a double scale at a ratio of 5 to 1, will indicate the total magnetizing current on the high scale, or the average current through each bar on the inner scale, provided five bars are being magnetized.

The installation at the Vanadium-Alloys Steel Co. is shown in Fig. 2. At this plant, bars are magnetized by remote control, using the push button shown in



# Cracks and Seams . . .

the illustration, Fig. 1. The magnetization is practically instantaneous, the bars being then removed to one of five other benches where Magnaflux powder is applied for inspection purposes. Scale normally present on the hot-rolled bars does not interfere with the inspection, and seams are regularly located in material of this type down to one-thousandth of an inch in depth. Fig. 3 shows the sharp delineation by the Magnaflux powder of a seam found in a 1-in. by  $\frac{1}{4}$ -in. flat bar.

As the magnetization used is of the circular type it has not been found necessary to demagnetize these bars, as there is practically no external polarity excepting at the location of a possible defect. This method of inspection seems to be considerably more rapid than old methods of filing and grinding, and is also more reliable as, in the past, it was quite possible in inspecting with a file to miss a discontinuous seam by a short distance, and thus fail in locating it.

The inspection of crankshafts is an interesting procedure. The chief types of defects occurring in crankshafts may be grouped under two general classes—those occurring during manufacture and before the crankshaft is put into use by the customer, and those occurring after varying periods of service. The first class of defects is usually of the type referred to above as being associated with seams and pipe in the original steel. They are longitudinal in extent and generally approximately, although not exactly, parallel to the axis of the shaft. If they appear at a fillet or at a bearing surface they are particularly objectionable. The Ohio Crankshaft Co., and others, are using Magnaflux inspection for locating these defects, using the bar inspection equipment shown in Fig. 1, modified to the extent that the contact rails are replaced by pillow blocks properly designed to

(CONTINUED ON PAGE 143)



FIG. 3—A section of a 1-in. by  $\frac{1}{4}$ -in. flat bar which contains a seam.

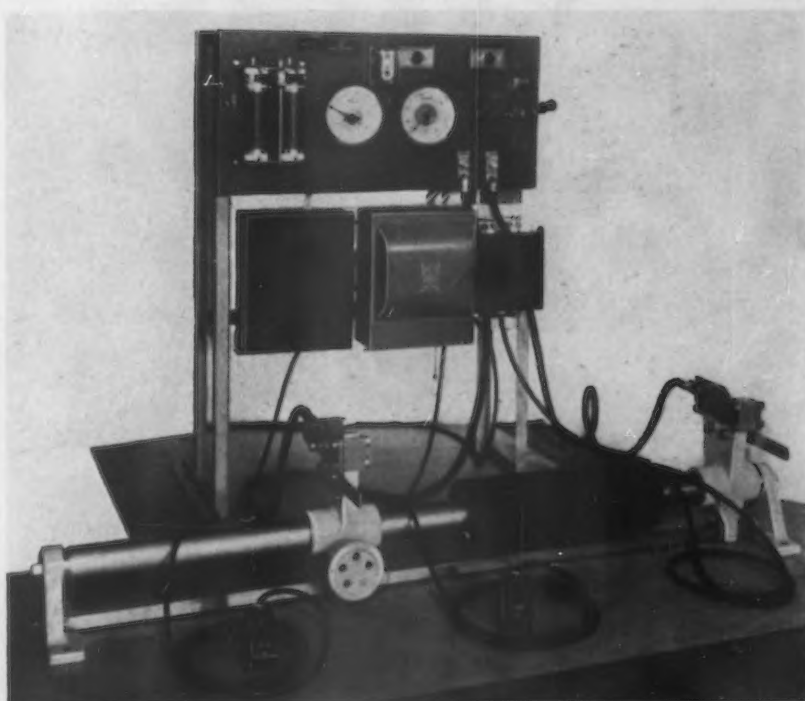


FIG. 4—Magnetizing equipment for Magnaflux inspection of crankshafts.

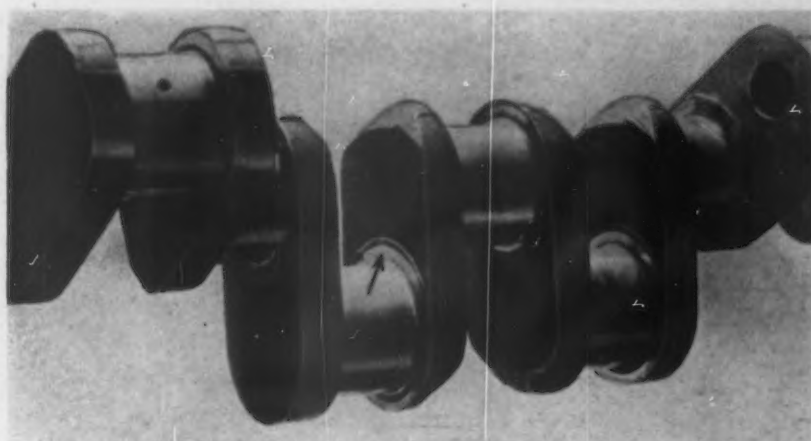


FIG. 5—Fatigue cracks found by the Magnaflux method in a crankshaft which had been removed from service for routine inspection.

# SEE THE J&L STEEL AT THE NATIONAL



Jones & Laughlin cordially invites all delegates and visitors to the National Metal Congress and Exposition to see its exhibits of J & L Steel products in Spaces C-11 and D-11. In this exhibit you will see not only samples of Jones & Laughlin products, but interesting examples of the work for which different manufacturers are using them.

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## HOT ROLLED BARS AND SHAPES

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## COLD FINISHED BARS AND SHAPES

Exhibit shows a number of samples of J & L cold finished bars and shapes.

## Technical Literature

Technical Literature covering all the J & L products on display will be available at the J & L Exhibit, Spaces C-11 and D-11.

# NITRIDED T

A MISCELLANEOUS collection of tools and products made from Cobaltchrom tool steel.



THE use of ordinary nitriding steels is too well known to require much comment. These steels are of the tough, structural alloy type, of moderate carbon and alloy content. They are usually heat treated to a Brinell hardness of about 300 in the unmachined state. Subsequently they are machined, and sometimes given a stress-relieving anneal prior to final machining, and nitrided in the finished state. These ordinary nitriding steels are available in the form of bar stock, forgings and castings, and are used for a great variety of purposes, including gears, shafts, plungers, valves, cams, etc., where great surface hardness and wear resistance combined with strength, toughness, moderate resistance to corrosion, and machineability in the heat treated state are required.

Ordinary carbon and alloy steels will not respond satisfactorily to nitriding. Steels for nitriding must be of special composition. Usually they contain about 1 per cent aluminum, but about 0.50 per cent vanadium may be substituted. A typical and much used nitriding steel, known as Nitalloy G, has the composition and physical properties shown in the accompanying table.

Heat treatment for this steel consists of quenching in oil or water from about 1700 deg. F., followed by a tempering in the neighborhood of 1000 deg. F. to 1100 deg. F. If the material is severely machined after tempering, a long stress-relieving anneal at about the tempering temperature should precede final machining to prevent deformation during nitriding.

The ordinary nitriding process consists in heating the finished work to 950 deg. F. to 1000 deg. F., for 40 to 90 hr. in a sealed container, through which anhydrous ammonia gas is passing. The work is then allowed to cool in the container. This procedure produces a very hard but thin case, and leaves the core unaffected. Inasmuch as there is no quench, the distortion which accompanies cyaniding or pack hardening is avoided, and greater accuracy of dimensions and

\*The author acknowledges with appreciation the valuable collaboration of Albert Goldman, Darwin & Milner Co., Philadelphia, in the preparation of this article.

<sup>1</sup> Darwin & Milner, Inc., Cleveland, Ohio.



# TOOL STEELS

BY HORACE C. KNERR\*  
*President, Metallurgical Laboratories,  
Inc., Philadelphia*

shape is possible. The nitrided case is at present the hardest condition produceable in steel. It corresponds to about 1000 Brinell, as measured with the Vickers (diamond point) machine. The total depth of the case is about 0.025 in., but the hardest part is about 0.005 in. deep.

## Tools Are Nitrided

While having a wide and growing range of usefulness, ordinary nitriding steels are seldom suitable for parts coming under the category of tools, or other purposes where extremely high surface pressure is applied. This follows from the fact that the core is not hard enough to support the case under such severe operating conditions.

In the constant search for better materials it has been found that certain alloy tool steels, apart from the lower carbon-aluminum steels especially designed for the purpose, respond well to the nitriding process after having been given their usual heat treatment. High-speed steel, especially of the cobalt type, has shown considerably increased life after nitriding, when cutting bakelite, fiber, various compounds, and other non-metallic materials. The nitrided edge appears to be less brittle than with ordinary nitriding steels, but will hardly permit much application in ferrous metal cutting. Nevertheless, one interesting case was reported in which an ordinary high-speed steel lathe bit doubled its normal life on a steel cutting job when nitrided, the increase apparently being due to the greater resistance to cratering afforded by the nitrided surface.

In another case, a molybdenum high-speed steel, nitrided, was used in an expanding punch to enlarge a previously formed opening in  $\frac{3}{4}$ -in. steel plate. This punch has been in satisfactory service for more

than a year. A variety of other tool steels had been tried for this operation without success.

An alloy steel known as Cobaltcrom—P R K<sup>1</sup> has shown remarkable results when nitrided and is the one with which the author has had the most experience. Its type analysis is 1.50 to 1.70 per cent carbon, 13.50 per cent chromium, 3.30 per cent cobalt, 0.80 per cent molybdenum, 0.20 per cent vanadium, 0.50 per cent nickel, 0.60 per cent silicon.

The heat treatment of this steel is as follows: Heat slowly to 1850 deg. F., until saturated, cool in still air or in oil. Temper to about 900 deg. F., according to use. For finished tools the heating may be done in charcoal or spent carburizer and followed by oil quenching to avoid oxidation. The Rockwell hardness after treatment is about C-61 to 63.

This Cobaltcrom steel is rather free from tendencies to crack, warp, shrink or deform during heat treatment, as compared with other tool steels. It is not a true high speed, or red cutting steel, but it develops some secondary hardness on tempering and its simpler heat treatment and certain other characteristics render it preferable to high-speed steel in many cases, especially where extreme wear resistance is required rather than fast cutting. It can be obtained forged or cast as well as in bar stock. P. R. K. steel contains no aluminum but does contain four elements, chromium, cobalt, molybdenum, and vanadium, all of which probably contribute to nitriding. When nitrided by the ordinary method (975 deg. F. for 40 to 90 hr.) after having been properly heat treated as outlined above, this steel develops an extremely hard case, running about 1050 to 1150 Vickers Brinell and about as deep as that of ordinary nitrided steels, being approximate-

ly 0.025 in. A microphotographic and physical examination of the nitrided case on Cobaltcrom will show that the core hardness is practically unchanged during nitriding and is immensely greater than that of ordinary nitralloy (Rockwell C-62 as compared with C-32), so that much higher bearing pressures may be used. The brittleness of sharp edges, inherent in ordinary nitriding steels, seems to be much less pronounced.

## Tempering Not Necessary

Measurements on cylinders about 1 $\frac{1}{4}$  in. in diameter before and after nitriding have revealed no perceptible growth or "building up" of the surface during nitriding of P. R. K. This compares with ordinary nitriding steels which grow about 0.0005 in. on the surface (0.001 in. on the diameter) presumably due to absorption of nitrogen in the case. It may be desirable, however, to allow 0.001 in. to 0.002 in. for grinding off the surface where high finish is required.

For certain purposes, tempering after quenching may be omitted, letting the nitriding treatment suffice. Where high accuracy of dimensions is called for, it is ordinarily preferable to temper immediately after quenching, and to correct dimensions by grinding before nitriding.

Decarburized surface material must be completely removed from ordinary nitriding steels, otherwise flaking is sure to occur. The same is undoubtedly true with P. R. K. steel, although up to the present time no difficulty has been experienced from this source. Decarburization during heating prior to quenching must, of course, be avoided, and this is taken care of by packing in charcoal as described. Surfaces should be cleaned with emery before nitriding. Very

(CONTINUED ON PAGE 96)

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Great Lakes Steel Corporation . . . . . Detroit, Mich.

The Producers Steamship Company . . . . . Cleveland, Ohio  
Owning and operating lake carriers

The Hanna Furnace Corporation . . . . . Buffalo, N. Y.,  
and Detroit, Mich.

Hanna Iron Ore Company . . . . . Cleveland, Ohio  
Ore Properties in Minnesota, Wisconsin and Michigan

Weirton Coal Company . . . . . Weirton, W. Va.  
Owning extensive coal lands in Fayette and Washington  
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Ammonium Sulphate	
Open Hearth Steel	Slabs Billets
Sheet Bars	Skelp
Angles	Beams and Channels Rails
Merchant Bars and Shapes	Steel Plates
Tie Plates	Track Spikes Splice Bars
Reinforcing Bars	
Forging Billets and Bars	
Coke Tin Plate	
Kanners Special Cokes	Best Cokes
Charcoals	Lacquered Tin Plate
Tin Mill Black Plate	All Finishes
Lacquered Black Plate	
Copper Bearing Terne Plate	
Galvanized, Hot Rolled, and Hot Rolled	
Annealed Sheets	
Corrugated Sheets	V Crimp Sheets
Roll Roofing	
Hot and Cold Rolled Strip Steel and	
Strip Steel Sheets	
Single Pickled, Full Finished and	
Auto Body Sheets	
Automobile Spring Steel	
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Michigan Metal for Vitreous Enameling	

# CORPORATION

# Control of Grain Size and Structure In

**F**ORGINGS of the medium carbon steel class, when used under service conditions involving alternate stresses, have highest resistance to fatigue under certain conditions of grain refinement and structure.

The service conditions referred to are propeller or wheel shafts of marine vessels, crankshafts and connecting rods of large internal combustion and steam engines. The following two statements have become well established by experience:

(1) Failures due to fatigue cracking tend to increase with greater operating speeds.

(2) Improper design, such as sharp changes in section, often causes fatigue breakage at higher operating speeds.

Both of these factors, which the alert manufacturer tries to guard against, are closely related to the structural condition of the forging. Ultimate grain size and structure are largely dependent on the shop heat treatment. A not unimportant influence is also exerted by the nature of the thermal treatment during which the forging is wrought.

Before the development of high-speed engines, as, for instance, the Diesel type, where ratio of horsepower to unit weight has been progressively reduced, a connecting rod or a crankshaft forging was thought to be satisfactory for the purpose if the tensile test gave a high ductility and a bend test could take the 180 deg. set over a 1-in. or 1½-in. pin without fracture. A typical specification widely used and which could be made to cover a wide range of grain sizes and structural types is as follows:

Tensile strength, 80,000 lb. per sq. in.

Yield point, 45,000 lb. per sq. in.

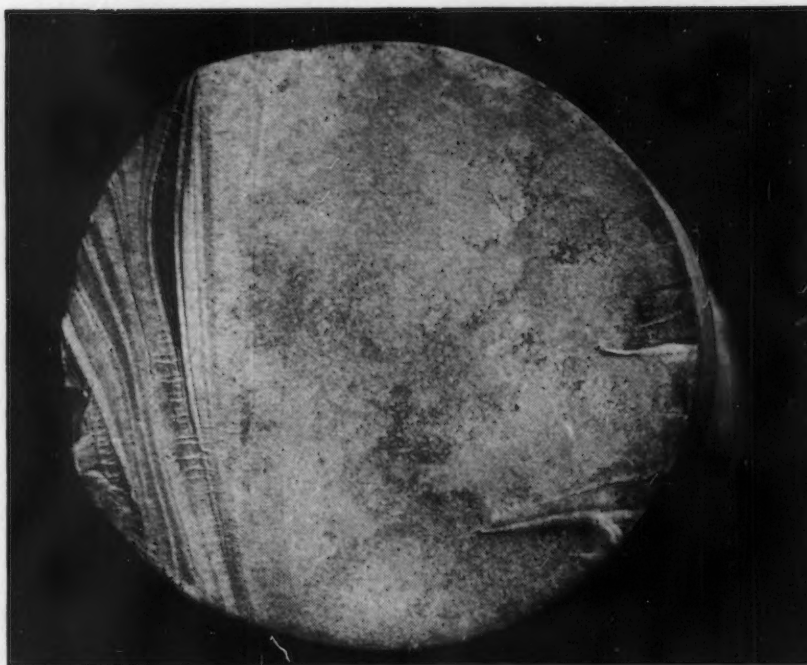


FIG. 1—Photograph of a characteristic fatigue failure due to eccentric loading.

Elongation in 2 in., 20 per cent.

Reduction of area, 35 per cent.

It may be said that specifications of this nature place a false value and reliance on ductility. Furthermore, where forgings call for a quench and draw heat treatment, this heat treatment could be neglected and the material supplied in an "as forged" condition meeting all requirements of the specification so far as physical properties revealed by a tensile test show. Usually such forgings are passed upon wholly by an inspector who witnesses the breaking of the test bar from the forging coupon, and the pulling of the test bar.

As the demand for greater operating speeds and lighter parts for the same power development increases, specification requirements must be shifted ever upward to keep in step. A point is then

reached where the carbon steels give insufficient ductility in relation to the higher tensile needs. A change to the various alloyed steels must then be made. The present discussion is limited to carbon steel forgings, ranging in section from 6 in. to 20 in., with a guide to grain size control during forging operations and also during heat treatment.

The usual type fatigue failure which may originate from improper operating conditions, improper design, or defective structural characteristics is illustrated in Fig. 1. The origin in a fatigue failure may be either on one side or on diametrically opposite sides, depending on whether eccentric loading has thrown highest stresses on one side or whether alternate stress loading of about the same intensity has progressed through the outer fiber of the moving part



# In Large Forgings by Heat Treatment

during the complete cycle of revolution. Improper operating conditions cover such details as unbalanced moving parts. Features of design which good practice tends to avoid in moving parts are sharp change in section in key-ways, grooves and slots, either cut longitudinally or transversely, and structures of medium carbon steels such as that shown in Figs. 2, 3 and 4 are considered defective in

By G. J. HORVITZ\* and  
G. BRINTON JACK, Jr.\*\*

draw heat after quenching was too high (about 1300 deg. F.) and had been prolonged to the extent that almost complete divorcing of the

carbides had taken place, resulting in a predominance of ferrite in the matrix. Use of a structure of this type would be questionable.

However, with a proper thermal range in the forging operations and a heat-treating procedure involving a quench and a draw, suitable structures of the types illustrated in Figs. 6 and 7 are obtained. The following physical properties on large sections are obtained. These physical data were formerly difficult, if not impossible, to obtain, due to lack of proper equipment to accommodate large-size sections and lack of proper technical procedure.

Six-inch diameter solid crankshaft: 72,000 lb. per sq. in. yield point, 114,500 lb. per sq. in. ultimate strength, 24.5 per cent elongation in 2 in., 56.8 reduction of area, and a Brinell hardness of 196. For a 32-in. diameter shaft with 12-in. bore the yield point is 74,300 lb. per sq. in., 115,100 lb. per sq. in. ultimate strength, 20 per cent elongation in 2 in., 46 reduction of area, and a Brinell hardness of 235.

These results are typical and are

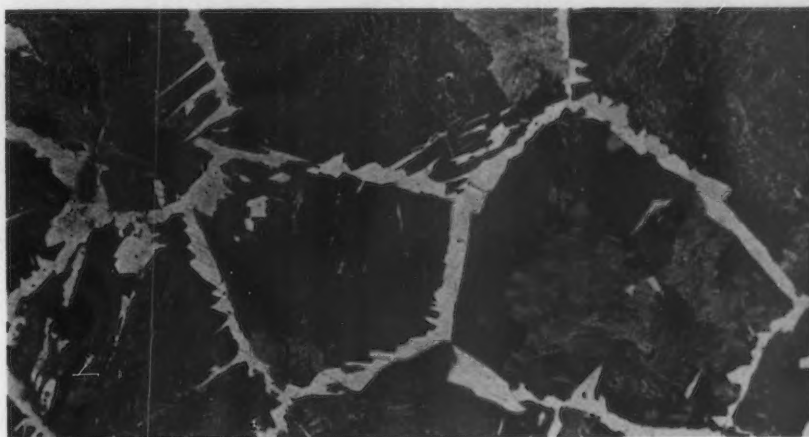


FIG. 2—The finish forging heat has been excessively high. The very large ferritic areas tend to form envelopes corresponding to the austenitic crystal size which would be difficult to eliminate in subsequent annealing. A structure of this type would give a coarse, variable grain with a quench and draw treatment. Taken at 100 diameters.

so far as imparting a sufficient high endurance limit to the steel in order to withstand normal service stresses. In Fig. 2 the finishing heat in the forging operation has been excessively high with no further heat treatment. The forgings shown in Fig. 3 with an intermediate grain size and Fig. 4 with a small grain size have been annealed only after forging.

In Fig. 5 the thermal treatment during forging, as well as subsequent heat treatment, have produced a fine grain. However, the

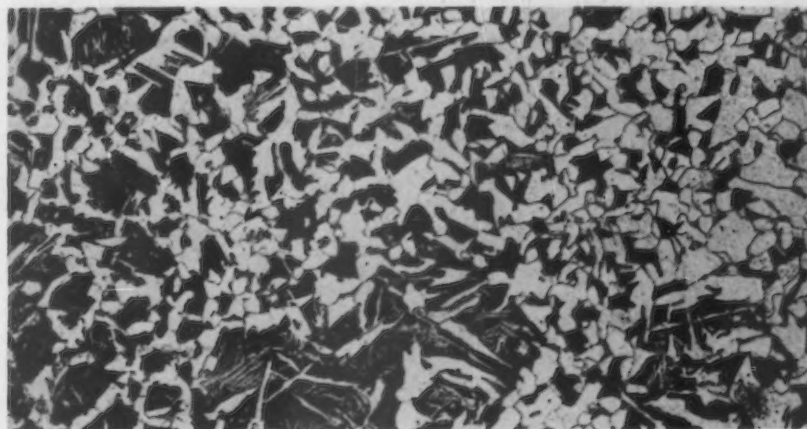


FIG. 3—This material has had an intermediate annealing heat. However, occasional coarse grains indicate excessive finishing temperature in the forging operation. Photo taken at 100 diameters.

\* Technical director of New York Testing Laboratories.

\*\* President of New York Testing Laboratories.

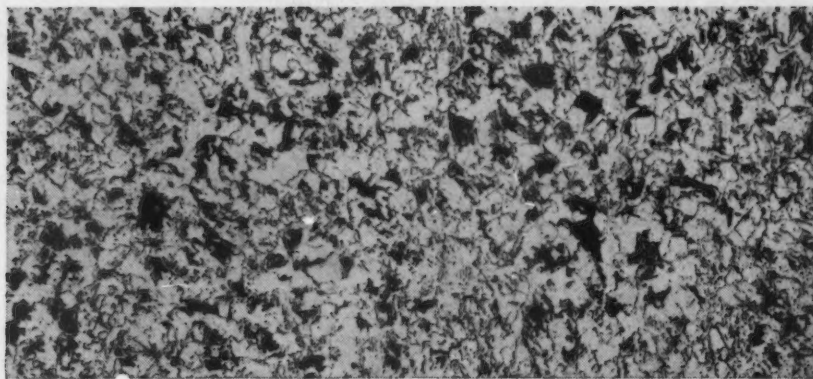


FIG. 4—The grain size is relatively small and fairly uniform giving a proper structural condition for the next heat-treating operation. Taken at 100 diameters.

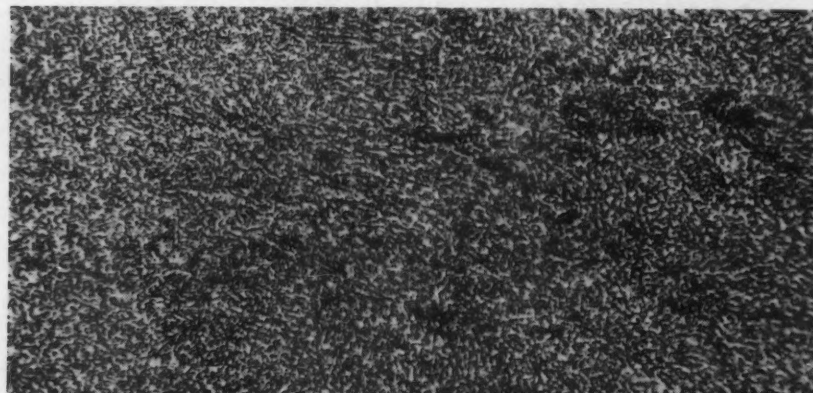


FIG. 5—Heat treatment has produced a small grain size. However, the draw heat has been too near the transformation range, resulting in partial spheroidization of the carbides. Photo at 400 diameters.



FIG. 6—A uniform small-grained sorbitic structure as shown here is readily obtainable on small to intermediate sized sections. Taken at 100 diameters.

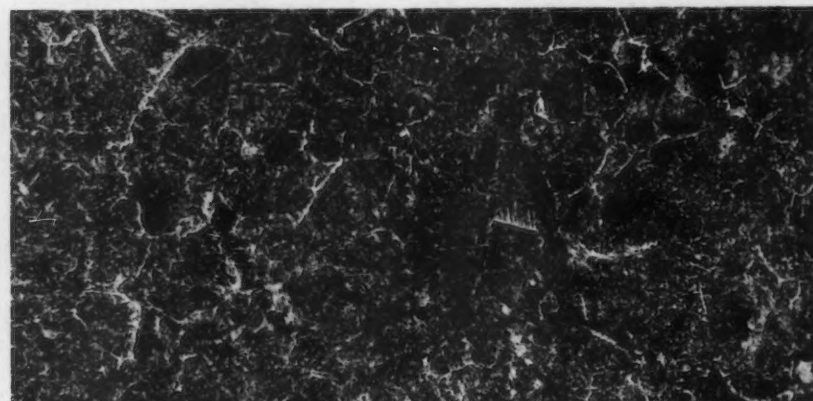


FIG. 7—A relatively small grained sorbitic structure with some unabsorbed ferrite is the usual type in intermediate to very large sized carbon steel forgings. At 100 diameters.

regularly found on S.A.E. 1045 when properly forged and heat treated under technical guidance.

A few of the more important points which must be observed in the heat treatment of material in this class and size are as follows:

(1) Proper type and size of furnace, together with pyrometric and burner control and maintenance of same.

(2) Calculations of time and temperatures from design and chemical analysis of forging material.

(3) Sufficient soaking after up to heat to insure a complete austenitic solution.

(4) Proper mechanical handling from furnaces to quenching tanks which requires high-speed electric cranes with correct design of hooks, tongs, chains, etc., for rapid grappling of forging from the furnace and transferring same to quenching tank.

(5) Cooling capacity of the quenching equipment should be sufficiently large to prevent excessive rise in temperature of the quenching medium.

(6) Atmospheric control to prevent surface decarburization and excessive scaling, incipient grain boundary oxidation and other deleterious defects.

(7) Proper rough turning and hollow boring (when necessary) before quenching.

(8) Time quenching to prevent excessive quenching strains.


(9) Placing in tempering furnace immediately after quenching and correct temperatures and time at temperature to give desired physical properties.

(10) Correct specifications for various designs of large forged sections or shafts.

(11) Final inspection to verify material to specification.

o o o





## A Message to the National Metal Congress

By L. E. BLOCK

*Chairman, Inland Steel Co.*

TO the members of the National Metal Congress I extend a hearty greeting and a warm welcome on behalf of the steel producers of the Central West.

It would seem remiss if I did not at least briefly refer to the medium through which I address you. For four score years THE IRON AGE has rendered invaluable service to our industry. Its able presentation of all noteworthy developments and its constructive attitude toward the various problems of both producers and consumers merit the appreciation and commendation of all.

Your selection of Chicago as the scene of your 1935 deliberations and discussions seems to be not only wise but, also, symbolic. All who are in any manner identified with this industry must be familiar with the general history, if not the detailed facts, of the phenomenal growth of the iron and steel producing facilities in this district. From practical insignificance in relation to other regions at the beginning of the century, it has risen in this short span of years to a place where it may properly challenge all other districts for leadership. The Chicago area's undisputed maintenance of a position of prime importance during the years in the immediate future seems assured.

Thus far the great progress of our industry, both here and throughout the country, has been characterized, in the main, by the tremendous growth and improvement in the instruments of production. That there will be continued achievement in this direction seems reasonable to expect.

Yet, I believe, the greater progress of the industry in the future will be in other directions. I refer to the merchandizing and to the metallurgy of steel. Unlike in many respects, these two must be active, aggressive partners in the future if the great production facilities of the industry are to be properly and regularly employed.

Those who are charged with the marketing of steel products must and will find more effective methods of distribution, so that steel will assume its proper place of usefulness for many new and untried purposes.

But to you of the National Metal Congress—many of whom may be properly referred to as "specialists" and "experts"—falls an even greater responsibility. Yours is the task of aiding and, in many cases, leading toward these new goals. Your studies and experiments toward discovering new and better steel and countless additional usages for these products will blaze the trail.

In a great measure, the industry is in your hands. For what you have done, all praise and credit. For the future—every good wish.



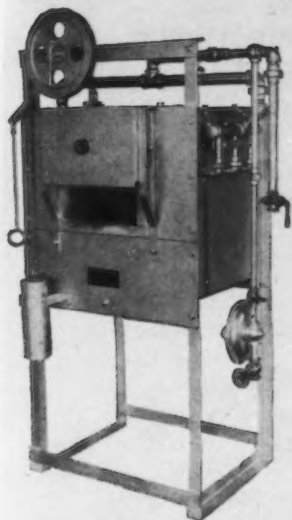
L. E. BLOCK, Chairman, Inland Steel Co. Drawn by John Frew for The Iron Age

High Speed  
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# IS YOUR FURNACE EQUIPMENT Modern?

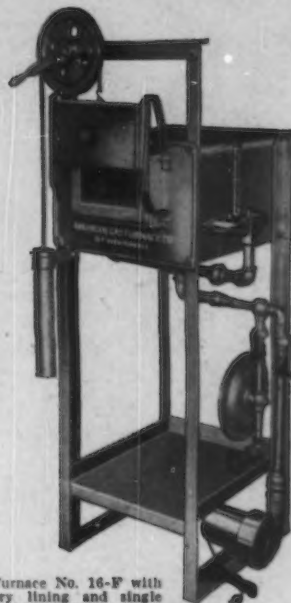


High Speed Oven Furnace No. 139, over fired and bottom vented to eliminate chimney action and infiltration of atmospheric air. Patented raw gas burners provide a reducing atmosphere for work that requires it.

What percentage of fuel is actually utilized for the heating of your product? . . . What are your upkeep expenditures? . . . Does your equipment produce uniformly satisfactory work? . . . Is manual or automatic control easily effected with your equipment? . . . Is a proper atmosphere readily established and maintained? . . . Are you employing the proper furnace or heating machine for your particular job?

**OUR EXPERIENCE OF OVER HALF A CENTURY IS AT YOUR COMMAND! MAY WE HAVE YOUR INQUIRY?**

**\*MODERN:**—Heat-treating equipment to be modern, must not only be designed to operate on a minimum of fuel, but must also be constructed to withstand severe thermal and mechanical use with small upkeep expenditure to effect **TRUE** economy and rapid amortization of its original cost.



Tool Room Oven Furnace No. 16-F with insulating refractory lining and single valve control. Manifold pressure gauge and small direct-connected turbo blower can also be supplied.



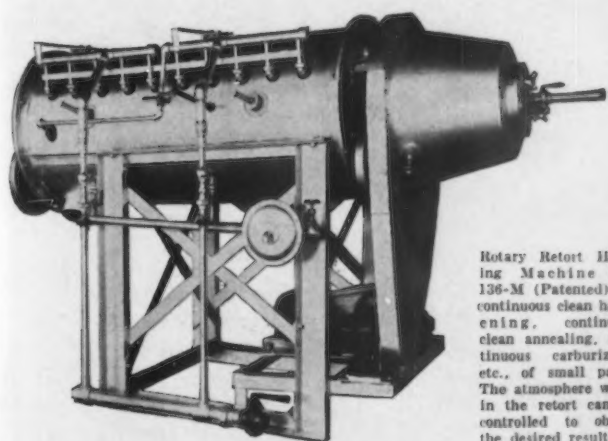
Down Draft Pot Furnace No. 209 with insulating refractory lining backed by insulation and provided with single valve ratio control. Especially designed for lead hardening, salt bath hardening, cyaniding and other pot heat treating operations.



Vertical Retort Carburizer No. 19 used for gas carburizing, rehardening, annealing, etc., of parts which it may be preferred not to agitate.

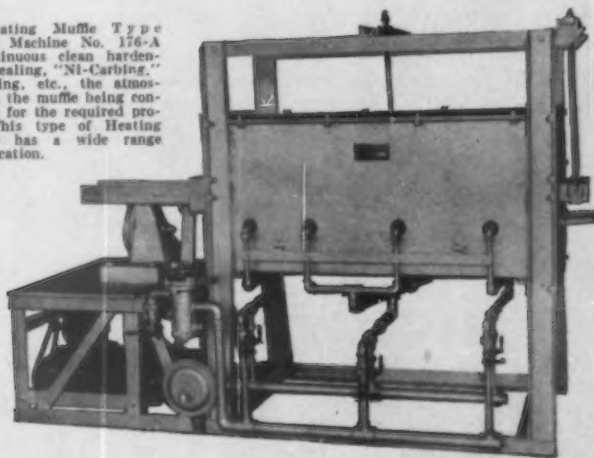


Rotary Carburizing Machine No. 2-C for gas carburizing, nitriding, "Ni-Carbing," bright annealing, hardening and other heat treating processes that may require any specific gas atmosphere.



Rotary Retort Heating Machine No. 136-M (Patented) for continuous clean hardening, continuous clean annealing, continuous carburizing, etc., of small parts. The atmosphere within the retort can be controlled to obtain the desired results.

Reciprocating Muffle Type Heating Machine No. 176-A for continuous clean hardening, annealing, "Ni-Carbing," carburizing, etc., the atmosphere in the muffle being controllable for the required process. This type of Heating Machine has a wide range of application.



**AMERICAN GAS FURNACE CO.**  
ELIZABETH, NEW JERSEY

ENGINEERING REPRESENTATIVES IN PRINCIPAL CITIES

# Hardness Testing of Nitrided Steels

(CONTINUED FROM PAGE 30)

for testing superhard surfaces, the Le Rolland pendulum obviates many disturbing external factors, such as vibrations, changes of temperatures, etc. Its hardness scale is calibrated against quartz, which mineral has been assigned a Le Rolland pendulum hardness of 1000. All readings are easily converted into Brinell, Vickers and Rockwell hardness numerals. The duration for one complete test on nitrided steels is about 90 to 110 sec.

Perhaps the only disadvantages of using pendulum tests for studying the hardness of nitrided steels are the requirements of almost a micro-polish for precise work, skill

of the testing engineer and utmost care in handling the equipment.

## Magnifier Hammer Used on Scleroscope

Dynamic hardness testing machines have received comparatively little attention by investigators for the determination of surface hardness of nitrided steels. The fundamental reason for this condition lies doubtlessly in the fact that the precision of these testing methods depends somewhat on the surface finish of the test piece and also upon the elasticity of the investigated material. In order to study the adaptability of the most common of these devices—the sclero-

scope—the writer has surveyed many specimens of commercially nitrided steels by means of the principal modifications of the Shore test. It is interesting to note that consistently better readings were obtained by a scleroscope equipped with a magnifier hammer. The diamond hammer seems to give greater variations and invariably lower readings. O. E. Harder and his associates report Shore values of 94 to 98 obtained apparently by testing nitrided surfaces with a diamond hammer. The author determined the scleroscopic hardness by means of a magnifier hammer and his results ranged from 101 to 107 Shore. G. M. Eaton has presented ample photographic evidence before the American Society for Metals, from which one is led to believe that the diamond point of the standard hammer becomes minutely chipped when striking superhard surfaces. Additional data supporting this opinion have been obtained by the writer when conducting so-called repeated scleroscope tests by striking an identical spot of a nitrided specimen with the magnifier hammer. Work hardening effects produce an increase in hardness up to about 28 blows; continued testing of the same spot, however, reveals somewhat irregular readings of lower magnitude. Table III summarizes this conclusive test series.

With perhaps one known exception, hot-hardness of nitrided steels has scarcely been studied by testing or research laboratories. A satisfactory explanation of this condition hinges on the selection of the proper method of investigating this important criterion of metals. Indentation methods cannot be used for reasons set forth in the second paragraph of this paper. The Herbert pendulum has so far been the only apparatus giving informative results on the hardness of nitrided steels at elevated temperatures. Some data obtained by this method are summarized in Table IV.

## Acknowledgments

The author wishes to acknowledge the generous cooperation and assistance received from Adam Steever of the Lindberg Steel Treating Co., Chicago, Doctor Harder of the Battelle Memorial Institute, Columbus, Ohio, L. F. Lottier of the Peoples Gas Light & Coke Co., Chicago, and of A. Weisenburg, Paris, France.

Table II  
Superficial Rockwell Hardness Numbers Under Various Loads for Nitrided Specimens

Article No.	Rockwell "N" Reading at a Pressure of		
	15 Kg.	30 Kg.	45 Kg.
1 .....	91.8	81.0	71.3
2 .....	93.2	81.4	...
3 .....	95.8	85.8	79.0
4 .....	93.4	83.8	74.7
5 .....	...	86.4	...
6 .....	94.5	85.1	76.6
Range for ordinary nitrided stock.....	90 to 95	80 to 86	70 to 78

Table III

## Repeated Scleroscope Tests on Nitrided Steel

Average of first	ten Shore scleroscope tests .....	110.8
Average of second	ten Shore scleroscope tests .....	112.8
Average of third	ten Shore scleroscope tests .....	114.4
Average of fourth	ten Shore scleroscope tests .....	113.6
Average of fifth	ten Shore scleroscope tests .....	113.4
Average of sixth	ten Shore scleroscope tests .....	112.8
Average of seventh	ten Shore scleroscope tests .....	112.3
Average of eighth	ten Shore scleroscope tests .....	111.8
Average of ninth	ten Shore scleroscope tests .....	111.5
Average of tenth	ten Shore scleroscope tests .....	110.7

Table IV  
Hot Hardness of Nitrided Steel

Temperature		Diamond Time Hardness (Herbert)	Approximate Brinell Hardness (By Conversion)
Deg. C.	Deg. F.		
20	68	76	1,030
50	122	76	1,030
100	212	74	1,000
200	392	73	985
225	437	78	1,050
300	572	80	1,080
400	752	75	1,010
500	932	56	760
600	1,112	46	620



# *The Stainless* SCRAPOSAURUS



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*~~ Remelt with*

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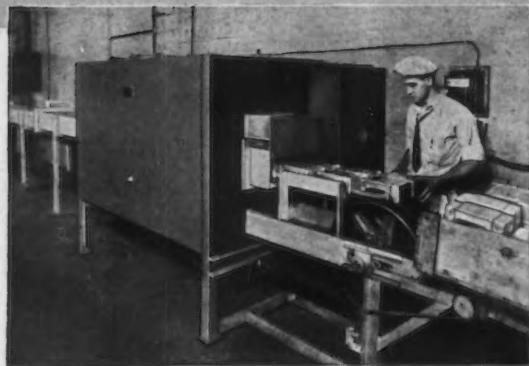
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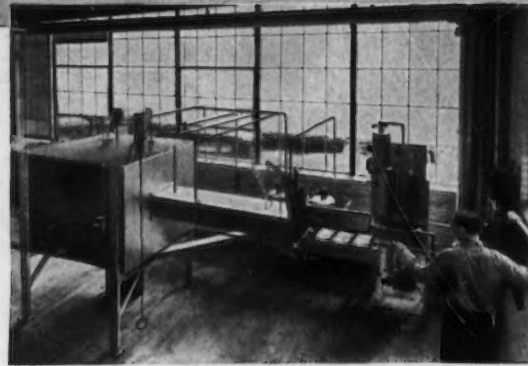
# GREATER PROFITS G-E ELECTRIC



## Crowe Name Plate & Mfg. Co. reduces rejects and pickling costs with this G-E CONTROLLED-ATMOS- PHERE ELECTRIC FURNACE

This G-E continuous-bright-annealing furnace is making three important savings for the Crowe Name Plate & Mfg. Co., Chicago, in annealing nameplates, radio dials, emblems, etc., between stamping operations. Since the parts annealed come out bright and clean, pickling costs are entirely eliminated. Because of the excellent temperature distribution in the furnace, all parts are annealed more uniformly, reducing the number of rejects and the wear and tear on the dies. Moreover, the dies now make clearer-cut impressions.

You may not make punchings and stampings, but if you anneal your product, a G-E controlled-atmosphere bright-annealing furnace will save you money through trouble-free service and long furnace life.

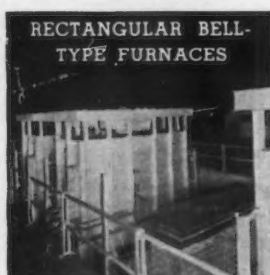


## How Remington Rand SAVES MONEY with G-E ELECTRIC-FURNACE BRAZING

The Dalton Powers Division of Remington Rand, Inc., located at Norwood, Ohio—makers of accounting and adding machines—is now making substantial savings in production and service costs by G-E electric-furnace-brazing more than 150 machine parts. Riveting, pinning, and torch brazing proved unsatisfactory and costly for many of the small parts which are subjected to repeated vibration and severe impacts during everyday service. G-E electric-furnace brazing has improved the strength, quality, and life of these parts by giving them strong, ductile, vibration-resisting joints. This has reduced rejects and service costs to the minimum.

If you are now riveting, pinning, soldering, or torch-brazing small parts subjected to severe stresses, G-E electric-furnace brazing will save you money.

## YOUR EVERY NEED IN ELECTRIC



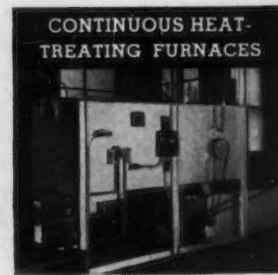
For annealing steel sheets



For annealing sheets, strip, bars, and tubes



For annealing stampings, punchings, coiled strip, and wire



For heat-treating small machine parts

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The steel companies in whose mills these pictures were taken, now bright-anneal their coiled steel strip in G-E controlled-atmosphere, bell-type electric furnaces because these furnaces assure them of a more uniformly bright-annealed product—a higher-quality product that increases sales possibilities. In addition to high quality, these companies obtain three other important advantages. These furnaces permit quicker shipments and a greater daily output at lower cost because of their shorter annealing cycle. Rejects are fewer, since every coil in the stack is bright-annealed uniformly as a result of the even temperature distribution in the furnaces. The low temperature differential between the heating elements and the charge means long resistor life and lower maintenance costs.

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# E L E C T R I C

THE IRON AGE, September 26, 1935—61

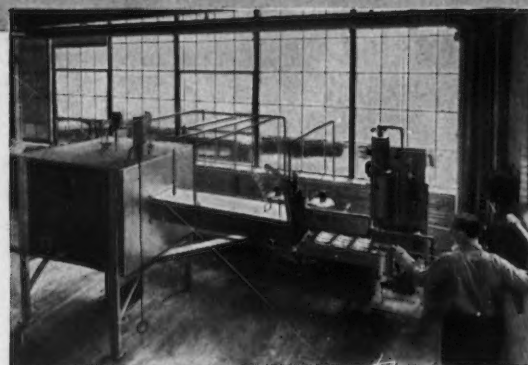
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For annealing sheets, strip,  
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For annealing stampings, punch-  
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machine parts

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For high-quality, low-cost  
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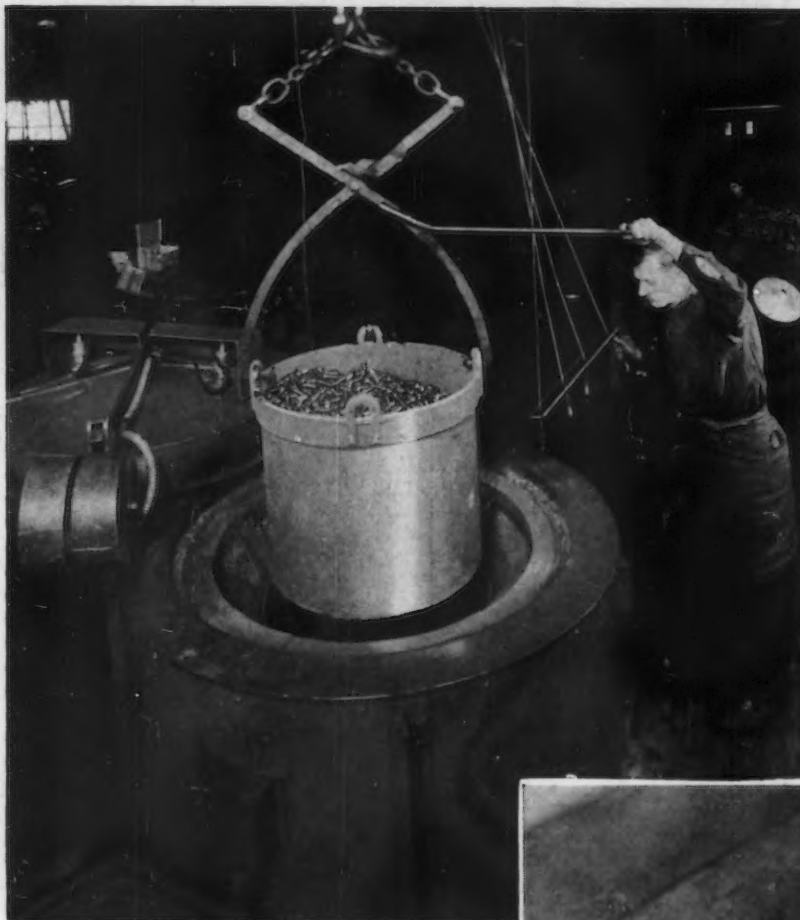


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# E L E C T R I C

THE IRON AGE, September 26, 1935—61

## DEVELOPMENTS OF THE



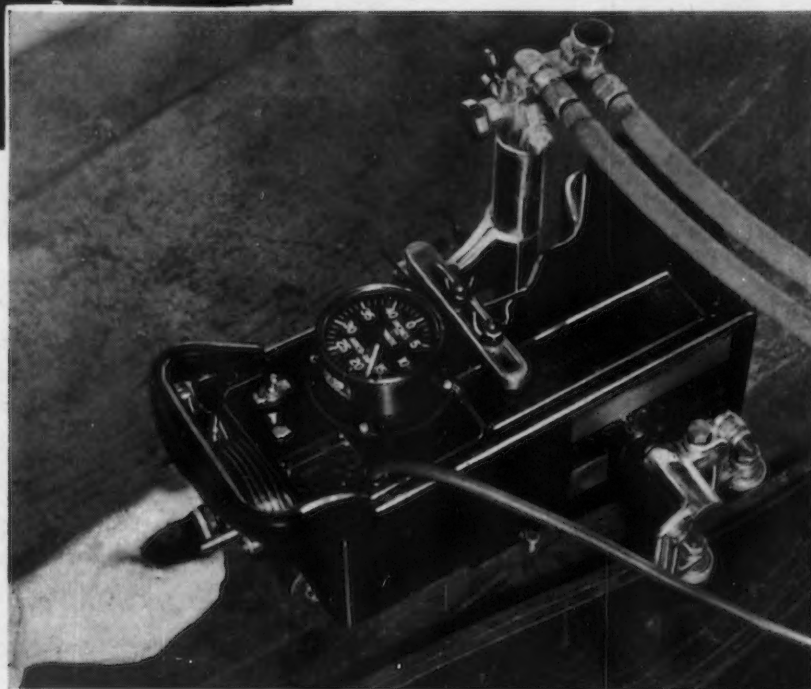
### AT LEFT

A NEW Homo automatic tempering furnace is to be featured by Leeds & Northrup Co., Booth E-42. This furnace is designed for high capacity on dense loads, and installations have proved very economical for fine tempering extra-dense loads.

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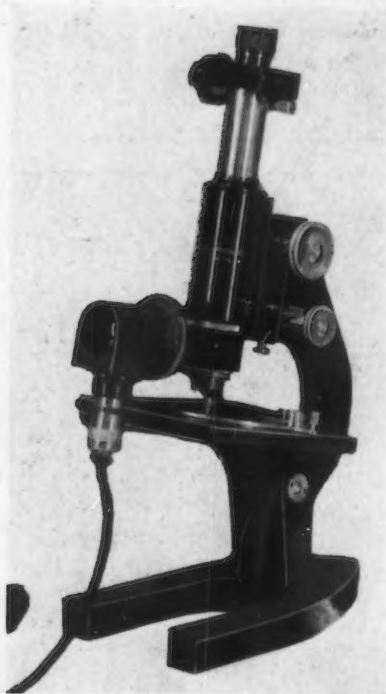
### BELOW

A NEW Tractograph with tachometer and side roller attachments is to be featured by Air Reduction Sales Co., Booth E-23. The improvements on this equipment are recent innovations and add greatly to the efficiency of this oxy-acetylene cutting machine.



### AT LEFT

THIS unique electroplater's microscope, for rapid and accurate measurement of plate depth, will be featured by Bausch & Lomb Optical Co. Each indicator division equals 0.00001 in. of specimen thickness. Other new instruments to be exhibited include a stereoscopic camera and grain-size measuring eyepiece.





## YEAR AT THE EXPOSITION

ACE MR-10 tank lining, a new product to be introduced by American Hard Rubber Co., Booth L-11. This product consists of a layer of hard rubber, overlying and united with a layer of soft rubber which is bonded to the steel tank. The reflected light comes from the glossy skin surface of the rubber which is particularly resistant to the action of chemicals.



BELOW

THIS edgewise multi-point pyrometer will be exhibited for the first time by Illinois Testing Laboratories, Inc., Booth J-11. The instrument is small, light-weight, extremely accurate, water-proof, fume-proof and dust-tight. A new direct-reading air velocity meter also will be exhibited.



ABOVE

A NEW design of a portable vacuum cleaner will be on display in Booth H-11 of the Spencer Turbine Co. This machine provides an exceptionally high vacuum at the end of the tool, where it is needed. This unit is a modified and condensed central vacuum system placed on wheels, and will accomplish the same job as a central system.

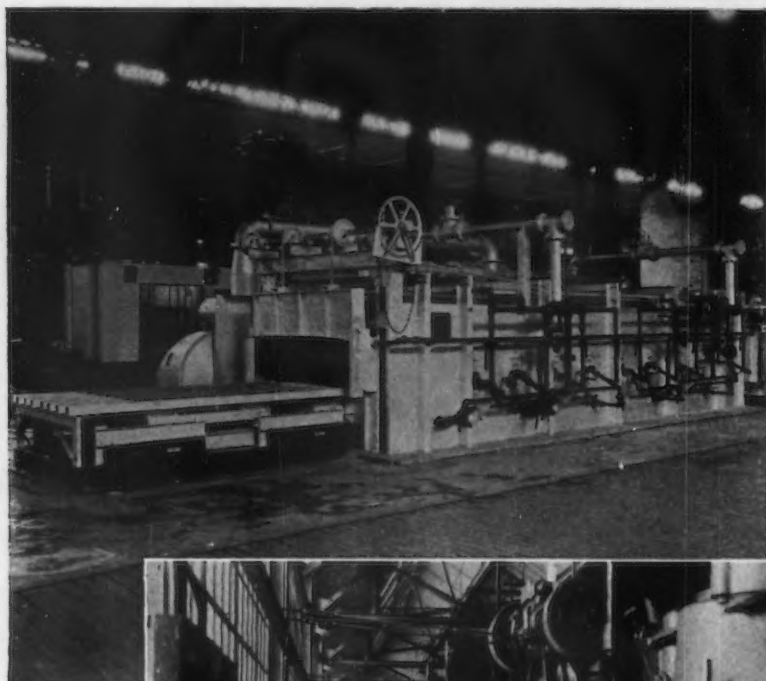


# CUT COSTS . . .

## WITH THE NEW FACTS ABOUT GAS

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Walking beam gas-fired normalizing furnace improves the quality of tin plate.



Battery of gas-fired forges cuts cost in this shop and adds to cleanliness.

Recent research, sponsored by the American Gas Association, has developed methods of using gas in industry which both improve quality of product and lower production costs.

This research has made gas available for many processes on a more economical basis than ever before; it has been an important factor in the development of new equipment which uses gas more efficiently and more economically; it has made possible and practicable the accurate control of furnace atmospheres which play so important a part in improving product quality; and in many processes it has speeded up production, improved quality, cut spoilage loss and definitely reduced over-all costs.

In this new research data on gas and gas combustion, there

[[ Visit the Industrial Gas Exhibit  
at the National Metal Exposition ]]

### AMERICAN GAS

INDUSTRIAL GAS SECTION . 420

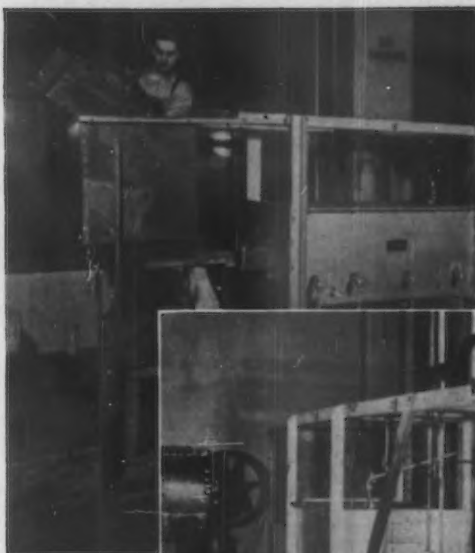


# IMPROVE QUALITY

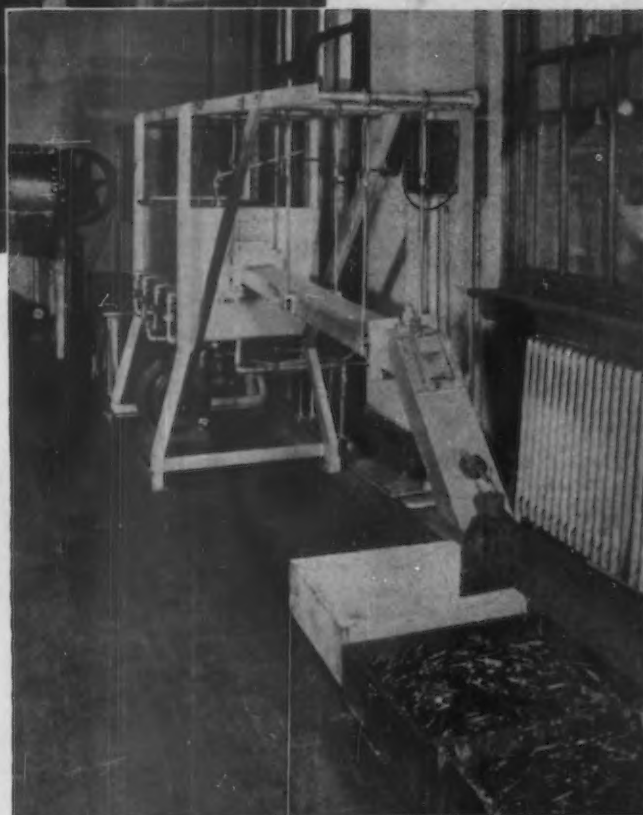
## DEVELOPED THROUGH RECENT RESEARCH

may be important information bearing on your own special problems. So why not get in touch with your local gas company industrial engineer, and have him study your heating processes.

He will be glad to give you, without charge, an accurate analysis of just what gas can do for you in the light of today's advanced knowledge of its possibilities.



High quality small steel parts clean-hardened at low cost in this furnace.



### IMPORTANT!

Copies of the following research reports are available to interested executives, **WITHOUT CHARGE.**

1. The Influence of Atmosphere and Temperature on the Behavior of Steel in Forging Furnaces.
2. The Surface Decarburization of Steel at Heat Treating Temperatures.
3. Baking Practice for Oil—Sand Cores.
4. The Application of Heat To Core Baking.
5. The Effect of Operating Temperatures on the Combustion of Industrial Gas.

Bulletin No. 1: Study of Combustion Chamber Wall Temperatures.

Bulletin No. 2: Practical Explanation of Newly Developed Combustion Knowledge.

6. A Study of the Characteristics of Burning Gas With Preheated Air.

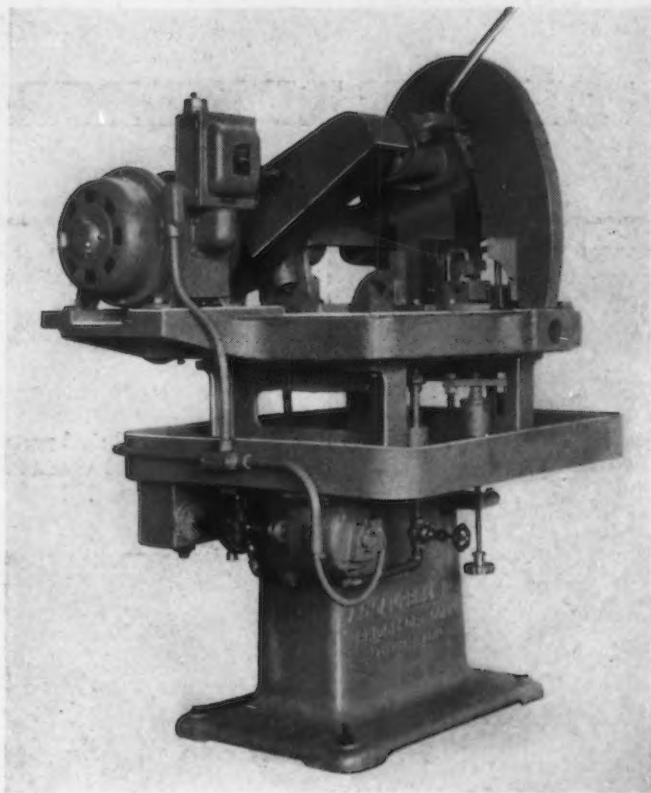
See your local gas company, or write direct to American Gas Association, 420 Lexington Ave., New York City.

THE TREND TODAY IS TO **GAS**  
THE MODERN INDUSTRIAL FUEL

## ASSOCIATION

LEXINGTON AVE., NEW YORK CITY

## DEVELOPMENTS OF THE YEAR AT THE EXPOSITION



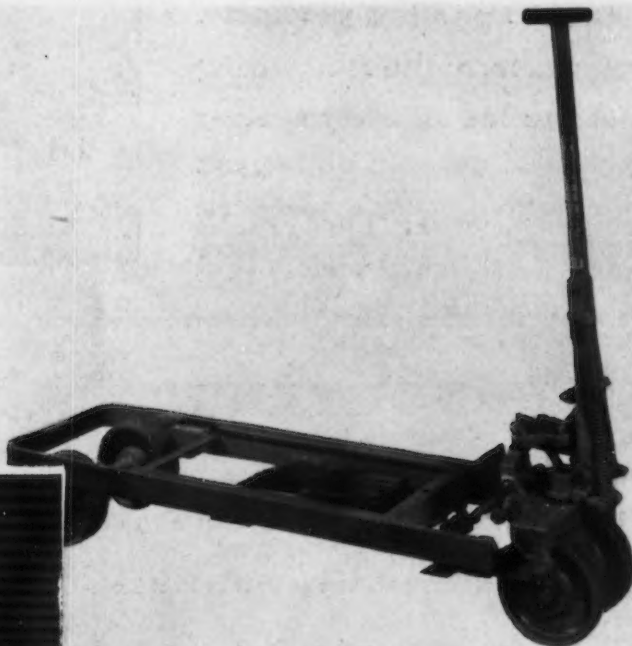
### AT LEFT

THIS new addition to a wide variety of cut-off machinery will be on exhibit in the booth of the Andrew C. Campbell division of the American Chain Co., Booth F-9. Cutting is accomplished by a revolving abrasive disk, and the major new feature is a novel method of applying the coolant.

o o o

### BELOW

THIS multiple lift truck, the Speed Boy, will occupy a prominent place in the Barrett-Cravens Co. display, Booth N-42. The truck requires little effort to operate, there are no parts to foul, it has free wheeling and an exceptionally high lift.



### AT LEFT

A GROUP of all-weld metal test specimens made with Murex electrodes will be on display in Booth D-30 of Metal & Thermit Corp. New Murex electrodes are designed to deposit metal closely matching new types of high-strength steels such as Cor-Ten, Mayari, etc. On display will be the new Murex carbon-molybdenum-0.50, and Murex 4-6 chromium electrodes. Welds having a strength of 100,000 lb. per sq. in. are obtained.

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# Greater Production - More Uniform Annealing with Vertical Tube Type Wilson Furnaces

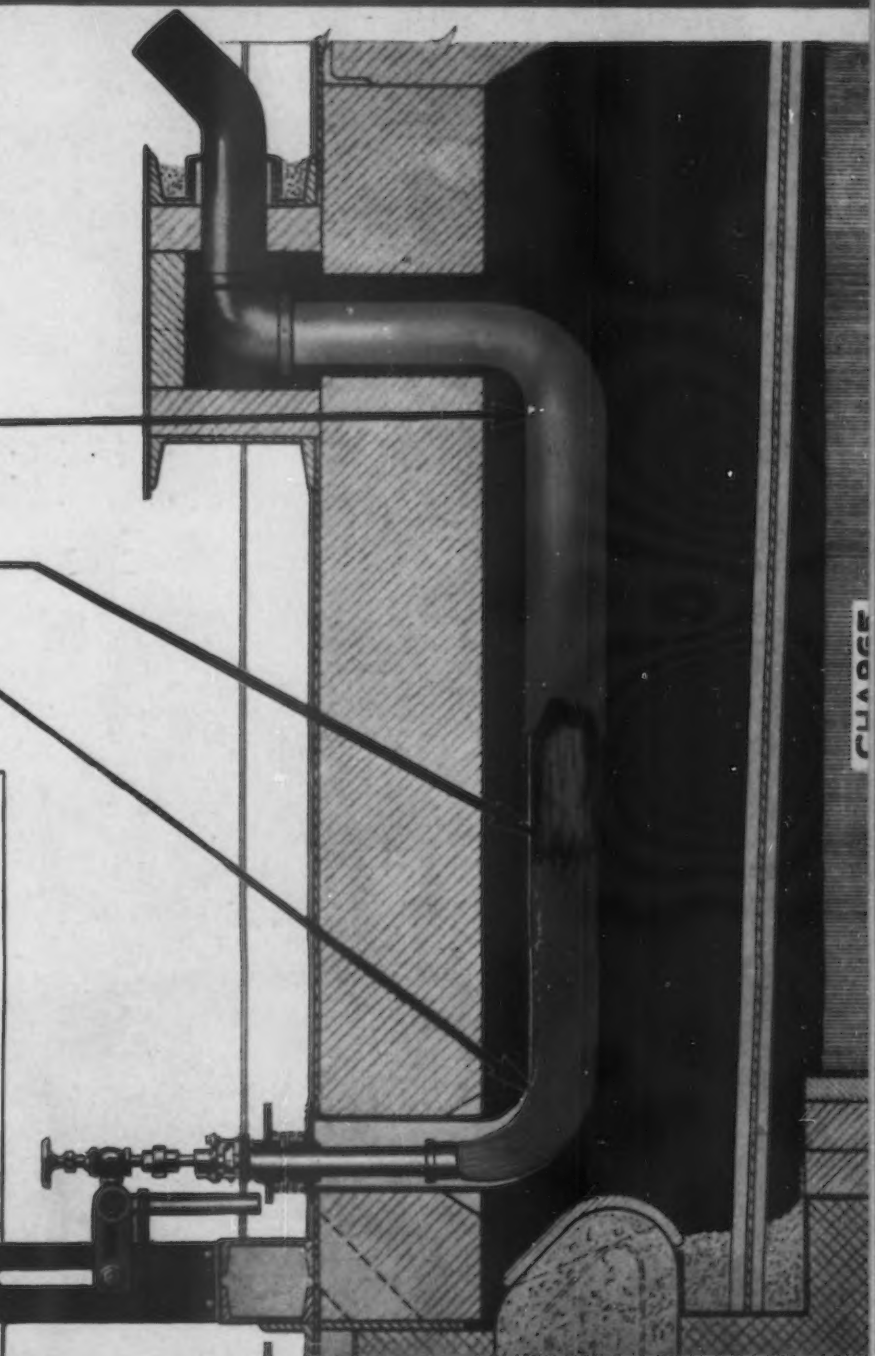
Our new Wilson Vertical Type Radiant Tube Annealing Cover will give you 20% GREATER PRODUCTION with more uniform annealing from bottom to top of the charge because the heat is applied where it is most needed—at the bottom of the charge.

The tapering off of temperature from the point of combustion, common to all tube type heaters, is utilized here to give the proper temperature gradient for uniform heating from the bottom to the top of the charge.

The upper portion of this tube absorbs and radiates heat from spent gases for heating the upper section of the charge.

Combustion completed at this point.

Maximum production with uniform heating can only be obtained by applying the heat at the point normally hardest to anneal—the bottom of the charge.

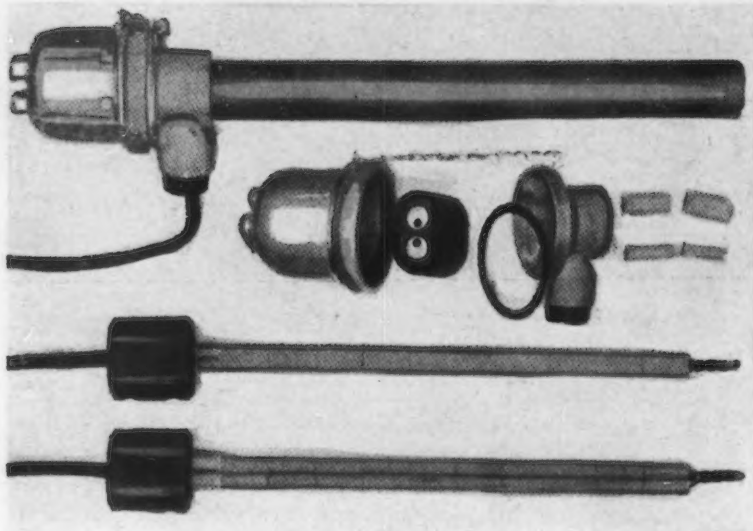


Wilson Annealing Unit is covered by Patent No. 1952402 and other Patents Pending.

**WEAN ENGINEERING COMPANY INC.**  
**WARREN, OHIO.**

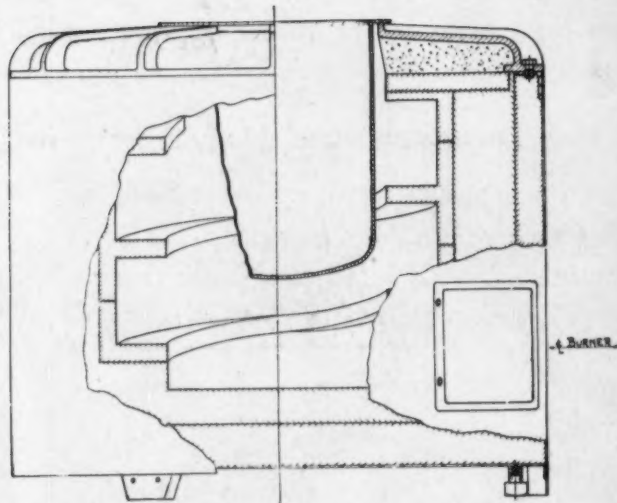
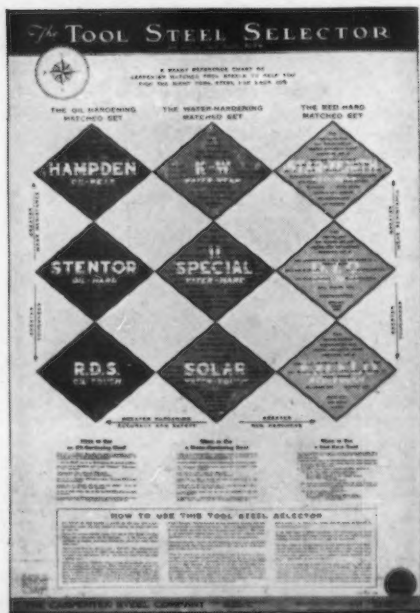
The Wilson Annealing Units sold by us are an exclusive development of  
LEE WILSON ENGINEERING COMPANY • CLEVELAND, OHIO

## DEVELOPMENTS OF THE YEAR AT THE EXPOSITION



THIS new thermocouple head will be featured by Claude S. Gordon Co., Booth I-10. The equipment is simple to install or repair, as only burned out parts must be replaced. The head, insulators and tube often outlast a number of thermocouples. Consequently new wires only must be bought.

THE Carpenter Steel Co., Booth C-20, will dramatize this new matched set method of selecting the proper tool steel for making all kinds of tools. By means of this simple diagram, a toolmaker can, of his own knowledge, select the proper tool steel for new tools or correct his troubles with old ones.



THIS new screw-type pot furnace will be introduced by Lindberg Engineering Co., Booth J-8. The combustion chamber is in the shape of an internal screw, and the gases of combustion are thus forced to circle the pot two and one-half times before leaving the heating chamber. This furnace in operation has shown an increase in production of 20 per cent.



# Instantaneous **ACTION**

with a **RECORDING CONTROLLER**

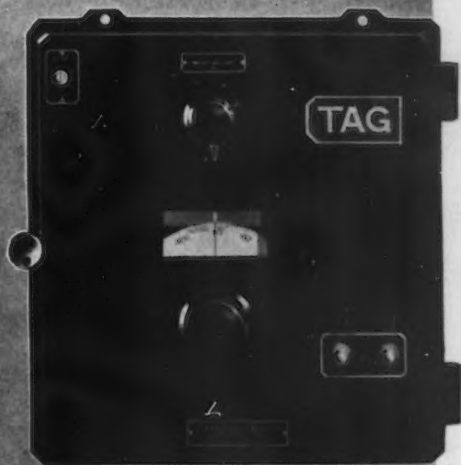
**This Performance of a Self-Balancing Potentiometer Can Be Achieved Only With TAG Photoelectric Detection**

A triumph in simple design and sensational performance. This instrument is not merely a Recorder with some Controller attachments, but is designed so that recording does not interfere with controlling. Made for on-off two-position and three-position control and guaranteed to control closer on any application. A close rival of the remarkable TAG Indicating-Controller which indicates with a brilliant line of light, which shows green, white or red for low, normal or high temperatures.

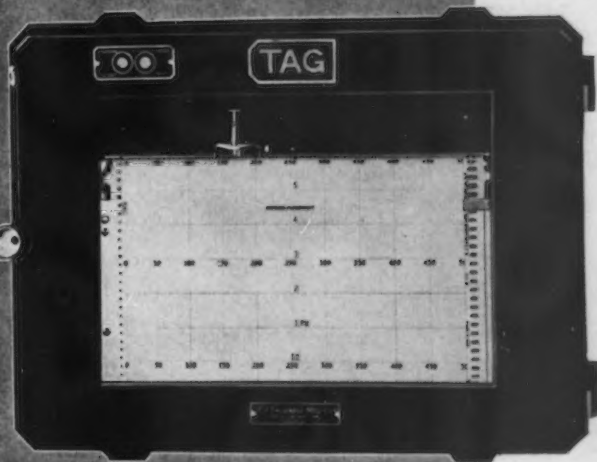
**TAG Pyrometer Controllers Operate With a Beam of Light, a Mirror-Galvanometer and a Photoelectric Cell**

Write for Bulletin No. 1101-64, which illustrates and describes TAG Pyrometers and Resistance Thermometers.

Visit Booth I-11 at the National Metal Show, and see what "simple design and sensational performance" means in a complete array of TAG Pyrometers: Recorders, Recording-Controllers, Indicators, Indicating-Controllers, Program-Controllers, Non-Hunting Throttling Recorder-Controllers, Resistance Thermometers, Thermocouples, Switches, etc.



**TAG INDICATING CONTROLLER  
PHOTOELECTRIC ACTION**



**TAG RECORDING CONTROLLER  
PHOTOELECTRIC ACTION**

**C. J. TAGLIABUE MFG. CO.**

Park & Nostrand Ave's., Brooklyn, N. Y.

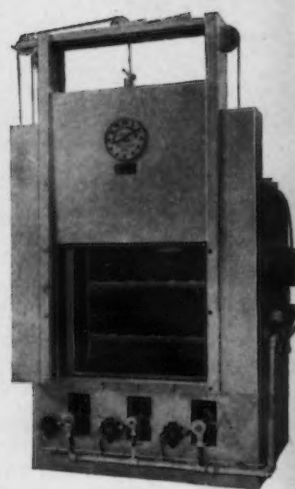


## DEVELOPMENTS OF THE YEAR AT THE EXPOSITION



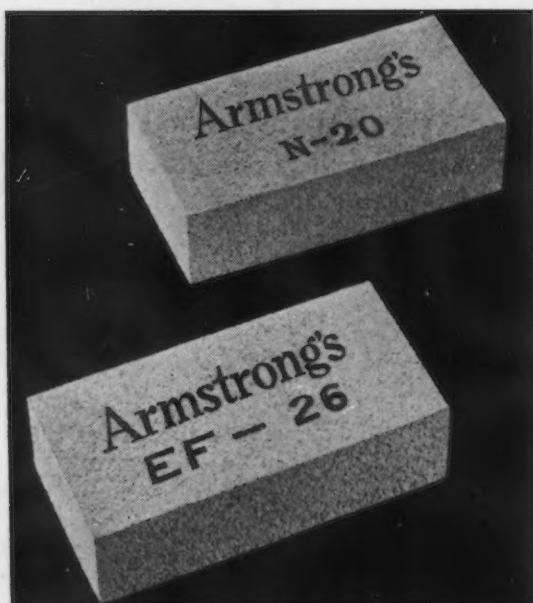
AT LEFT

THE engineers of Bastian-Blessing Co., Booth K-34, have improved the construction of the Rego Economizer. This reconstructed device has a lever arm assembly which automatically keeps the plunger mechanism in adjustment. Note that in place of the adjusting screws formerly used, there is a rocker attached to the top of the lever which automatically adjusts itself.



AT RIGHT

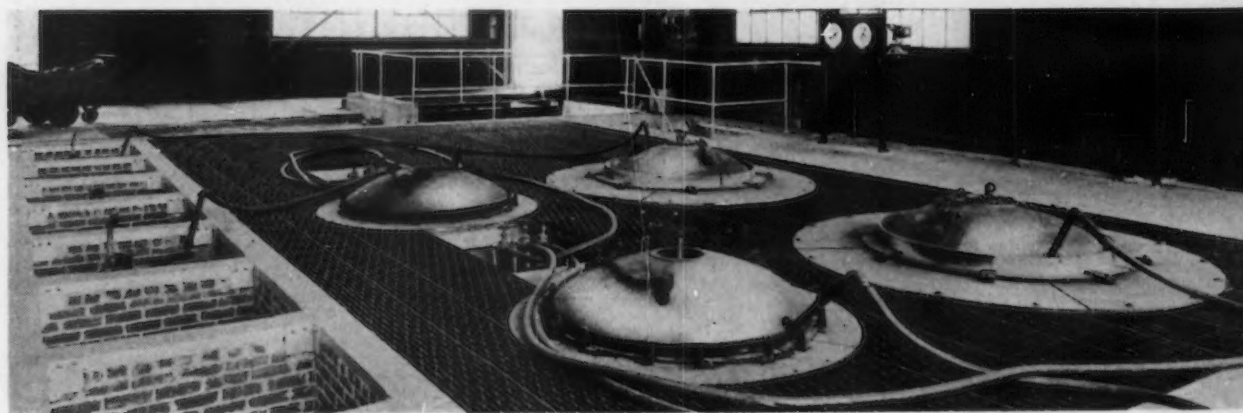
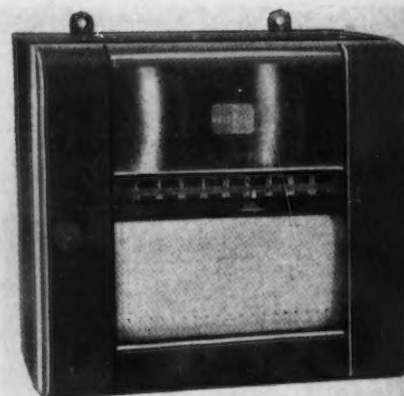
A NEWLY improved convected air furnace, gas heated, for tempering and drawing, will be in operation in the booth of Despatch Oven Co. The parts are heated at a much faster rate and more uniformly, due to the mechanical principle of a rotary fan which drives the heated air downward with pressure and great velocity in and around the parts to be processed.



ARMSTRONG CORD PRODUCTS CO., Booth L-11, will introduce these two new high-temperature insulating bricks. Type EF-26 insulating fire brick is for direct exposure up to 2600 deg. F. Type N-20 is for backing up a refractory where the interfacial temperature does not exceed 2000 deg. F.

AT RIGHT

THE Bristol Co. will display its new wide-strip pyrometer, which is available in single-record, multiple-record and recorder-controller types. A stainless steel lead screw, operated by an electric motor under the direction of two galvanometer-controlled contacts, adjusts the slide-wire contact and recording-pen unit to maintain emf. balance in the potentiometer system.



THIS pit-type furnace for bright-annealing wire has just recently been developed by the Electric Furnace Co., Booth G-8. A light, heat-resisting alloy pot contains the charge and thus protects it. The pot and charge are independently supported. Advantages of this equipment include increased tonnage per pit, improved fuel economy, more uniformly annealed wire, lower maintenance cost, decreased annealing time and maximum flexibility.





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# Most Extensive User of Can Help You

**HERE IS ONE OF THE MANY PROBLEMS  
SOLVED IN G-E FACTORIES, BY G-E EN-  
GINEERS, WITH G-E WELDING SETS  
AND ELECTRODES**

## THIS WAS THE PROBLEM

In the manufacture of the G-E domestic oil furnace, it is necessary that the welds produced be of the highest quality in order to withstand the intense heat of the burning air-oil spray. Also, for the boiler to give the home owner life-time service, the life of the welds must be equivalent to that of the fire-box steel of which the boiler is constructed. All welding on each boiler must be approved by a boiler-insurance-company inspector before the boiler is permitted to leave the factory.

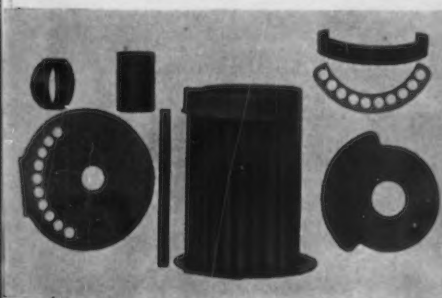
Also, it was essential that arc welding demonstrate its economy as a manufacturing process.

## IT WAS SOLVED THIS WAY

G-E multiple-operator welding sets and G-E type W-20 electrode are used in the fabrication of the boiler. Welding operators easily learned to handle this wire, and its use facilitated welding in all positions. Welds are free from porosity and have the high tensile strength, ductility, and corrosion resistance required for the boiler. They have met these requirements under pressure tests as high as 700 pounds per square inch.

The ease of welding with W-20 electrode, and the excellent arc stability of the multiple-operator welder with individual resistor-reactors, made possible increased welding speeds and better quality.

Parts of combustion chamber, and tube drum, for G-E oil furnace



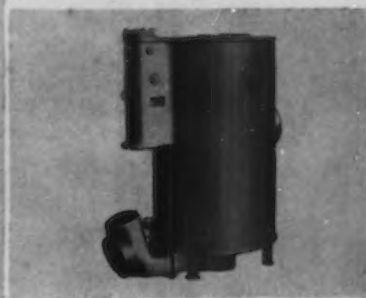
Tubes being arc-welded to upper tube sheet of boiler for G-E oil furnace



Left to right: Water-heater chamber outer shell, combustion chamber, and tube drum



Boiler completely assembled by arc welding with W-20 electrode and G-E multiple-operator welder with individual resistor-reactors



In addition to welding sets and electrodes, General Electric has a complete line of accessories and cable. The G-E welding distributor and G-E sales office nearest you are always ready to give you expert engineering advice and prompt, efficient service. They will be glad to supply you with further information on G-E arc-welding equipment. General Electric, Schenectady, N. Y.

140-31

# E L E C T R I C

# Residual Stress Effects in Arc-Welded

**T**HIS paper presents some measurements and observations of the effects of residual stresses due to metallic arc welding on mild steel. The work is a continuation of that reported upon at the fall meeting of the society in October, 1934.<sup>1</sup>

The object of the present investigation was to observe the behavior of welded plates under static tension load, and the variations in this behavior from that of an unwelded plate under similar conditions of average stress. It has been shown that, in the direction parallel to the welds, relatively high tensile stresses are present in the weld metal and immediate proximity, accompanied by compressive stresses of rather lower intensity in the parent metal more remote from the weld. A long, narrow plate, to which weld metal has been applied along the long edges, would show a distribution of elastic stress at an intermediate cross-section of the character shown in Fig. 1. The cross-section is in equilibrium, so that the total tension equals total compression. The tensile stresses are confined to weld metal and the parent metal in the immediate vicinity. All stresses here referred to are represented by elastic strains.

If such a plate is now subjected to a tensile load in a direction parallel to these stresses, the stress distribution across the plate will be the resultant of the two stress systems and will be the algebraic sum of the stresses so long as the

metal behaves elastically. Thus the resultant stresses in the vicinity of the welds will, under this condition, always be considerably in advance of the average stress, and this material will reach its yield point while the stress in the material within the body of the plate is below that value. When this occurs, the more highly stressed material loses all or some of its ability to resist tension until it has stretched to correspond with its yield point strain. As this large deformation cannot occur in the solid plate, the overstressed material transfers its load to the portion which is still elastic, thus reducing the effective cross-section. If load-deformation observations are made on such a plate, and a stress-strain curve plotted therefrom, the unit stresses being calculated on the basis of the gross cross-section, these stresses will be progressively smaller than the true elastic stresses, and the curve will therefore deviate from the straight line to be expected from a plate free from initial stress. Moreover, such deviation should occur initially when the total of applied stress and residual stress at any point in the cross-section equals the yield point of the material.

## Nine Plates Tested

The series comprised five plates of mild steel each  $4\frac{1}{4}$  in. by  $\frac{5}{8}$  in. by 5 ft. long, referred to as numbers 1, 3, 5, 6 and 7, and four plates  $4\frac{1}{4}$  in. by  $\frac{5}{8}$  in. by  $2\frac{1}{2}$  ft. long, referred to as numbers 2, 4, 8 and 9. Plate numbers 1 to 7 inclusive were machine grooved along both edges, the groove being U-shaped with a cross-section area of 0.08 sq. in. Plates numbers 8 and 9 were machined as tensile test specimens, their mid-section being reduced to 4 in. in width. All

the plates were then stress-relieved at 1150 deg. F. in order to remove rolling and machining stresses. The two short plates, numbers 2 and 4, were cut up and measured after welding to determine qualitatively the distribution of residual stresses in the direction of the welds.

Four long plates, numbers 1, 3, 5 and 6, were welded and tested to destruction in tension. One long plate, number 7, had no welding done on it, but otherwise was treated exactly as were the four long welded plates. The coupons were used to check the stress-strain data obtained from plate number 7.

For welding, the plates were set up at a 45-deg. slope and in order to produce large residual stresses each edge was welded continuously from lower to upper end, filling the groove in a single pass, using a  $\frac{1}{8}$ -in. by  $1\frac{1}{2}$ -in. copper chill bar on each side to prevent burning the edges of the groove. The electrodes were  $5/32$  in., covered, of the type suitable for vertical and overhead welding. The current was direct, with the electrode negative and the work positive, a current of 110 to 120 amp. and an arc voltage of about 22 being employed. The welded plates were not treated in any way after welding. The ratio of weld section to parent section was 5.75 per cent.

Deformation measurements on plates 2 and 4 were made on a linear comparator, and were confined to a gage length of 10 in. at the mid-length of the plate. Six lines of measurements were taken, and the plates subsequently cut into six strips. Strain measurements on plates 1, 3, 5, 6 and 7 were made with Martens extensometers on a gage length of 8 in. at the mid-length of the plate. Two

\*Contribution to the Fundamental Research Committee, A.B.W. To be presented at the fall meeting of the American Welding Society, Sept. 30, at Chicago.

<sup>1</sup>"Some Measurements of Residual Stress in Arc-Welded Steel Plates," R. E. Jamieson, *Journal of the American Welding Society*, December, 1934, p. 17.



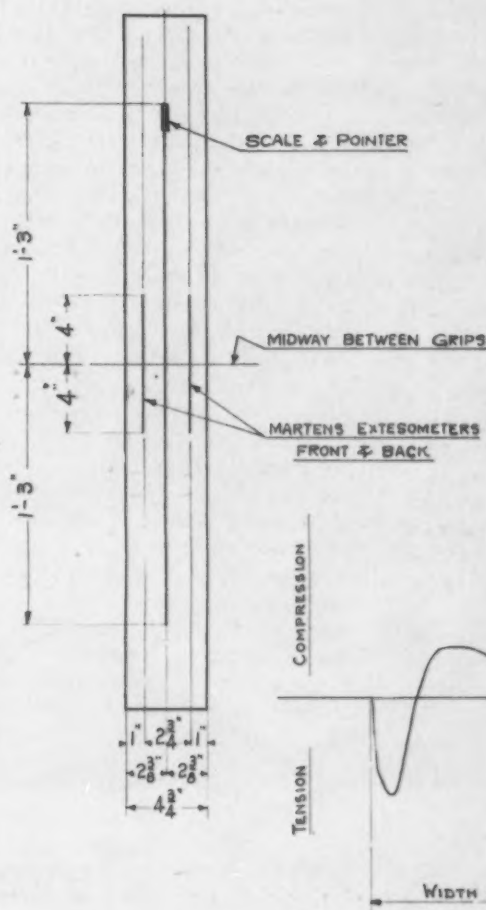
# Static Tension Specimens\*

By R. E. JAMIESON  
Professor of Civil Engineering, McGill  
University, Montreal

pairs of instruments were used, on lines at 1 in. from each edge of the plate. For reading the large strains occurring after the yield point, a sliding pointer and steel scale on a gage length of 30 in. were used. The Martens extensometers read to 0.0001 in. and the steel scale to 0.01 in., and it was readily possible to estimate these readings to one more place of decimals in each case. Fig. 2 shows the arrangement of scale and extensometers. The plates tested to destruction were held in wedge grips in a Wicksteed machine of 100-tons capacity.

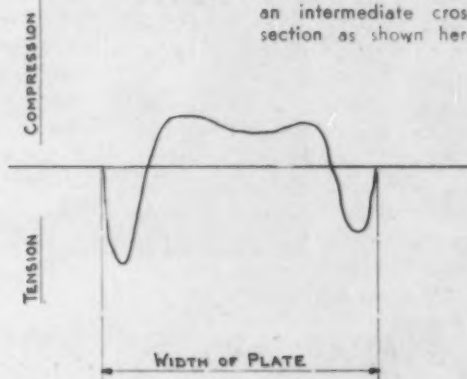
The accompanying table gives the recorded measurements of shrinkage and recovery for the several strips of plates numbers 2 and 4. For convenience, both shrinkages and recoveries have been converted into terms of unit stress, using a modulus value of 30,000,000 lb. per sq. in. Only the recoveries represent true elastic stress. In most cases the original measuring marks on the outer strips were obliterated during the welding so that the shrinkage measurements here were not obtained, and are left blank in the table. The minus sign represents shortening and initial compression.

It will be noted that the results for the two plates are generally in close agreement throughout. The great variation in initial shrinkage from a maximum at one edge to a minimum at the other may be explained by the fact that one edge of the plate was welded complete before welding was started on the other edge. Unfortunately, no record was kept as to which edge was welded first, but it seems fair to infer that it was the one showing the smaller final shrinkage. The residual elastic stresses vary in accordance with the results of pre-



AT LEFT  
FIG. 2—Arrangement of scale and extensometers to determine the welding strains in the plates.

BELOW  
FIG. 1—A long narrow plate, to which weld metal has been applied along the long edges, would show a distribution of elastic stress at an intermediate cross-section as shown here.



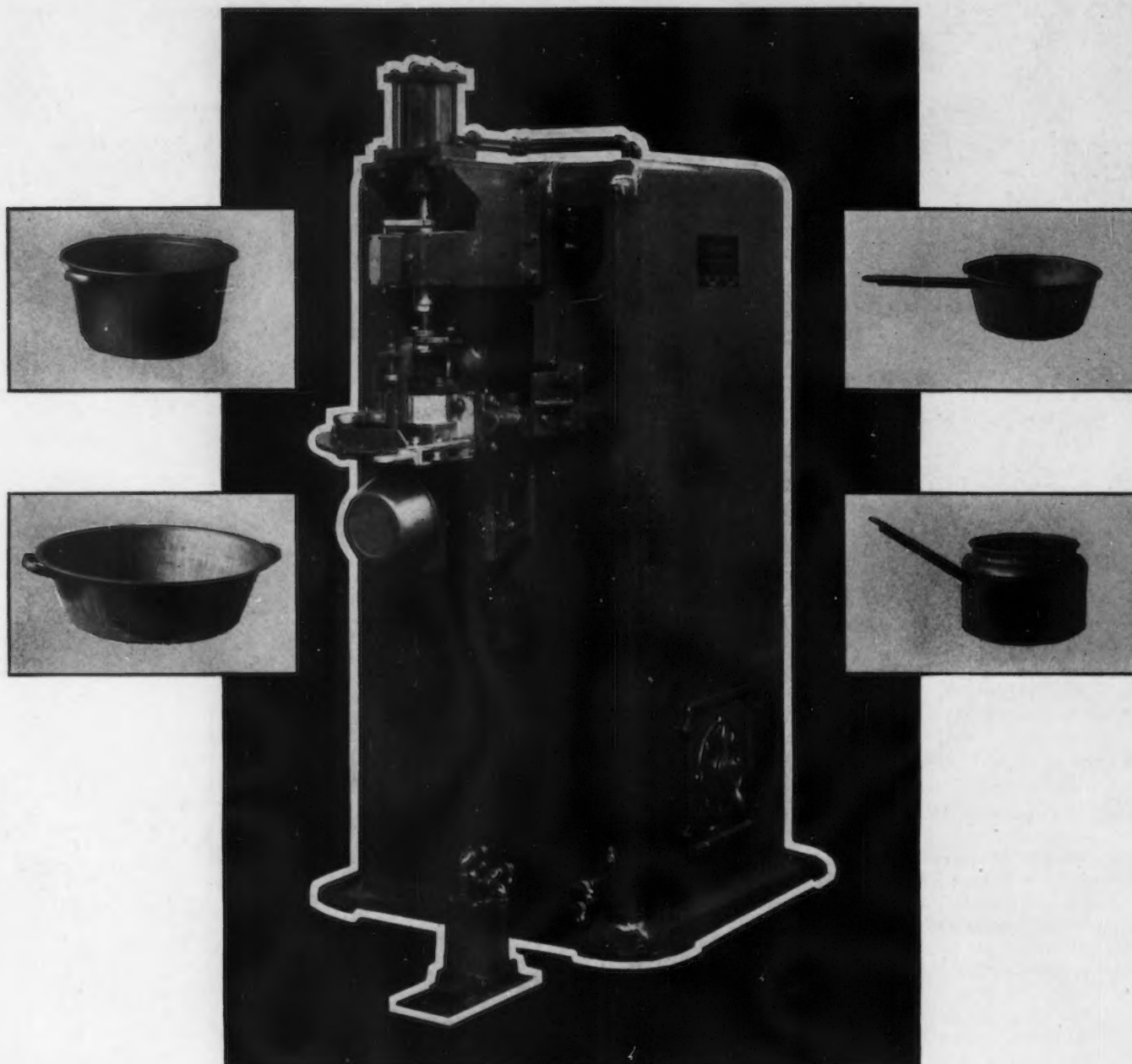
vious tests. The area above the base line represents a total compression force of 17,000 lb. and that below the line a total tension of 13,650 lb. Having regard to the probable errors in the measurements, it may fairly be said that the plates had residual tension stresses of from 22,000 to 25,000 lb. per sq. in. near one edge, and from 16,000 to 20,000 lb. per sq. in. near the other edge.

## Edges Yielded Differently

In Fig. 3 are shown the graphs of the extensometer readings

plotted against average applied stress, obtained by dividing applied tensile load by gross cross-sectional area of plate. In computing this area it was assumed that the weld material just filled the grooves. Separate graphs are shown for each gage line measured, and on the graphs for plates numbers 1, 3, 5 and 6 a dotted straight line indicates the mean curve for a normal plate as obtained from plate number 7.

Plates numbers 1 and 5 were partially loaded and then partially  
(CONTINUED ON PAGE 84)



## A New *Federal* Development . . . . And What It Has Done

Handles on enamelware present a costly problem to enamellers. A complete union of handle to utensil is rarely obtained by spot welding or gas welding on a low-cost production basis. Acid or alkali gets in between the two and generates a gas during enameling which leaves a black line around the handle anchorage.

Federal has solved this problem with a new development known as Federal Percussion Welder here illustrated. It butt welds the handle directly to the side of

the utensil without any flange. Thyatron current control helps to prevent extrusion of excess metal at weld. A complete and smooth union is produced which delights the enamellers. And this welder has greatly increased the production as well as the quality of this operation.

What resistance welding problem have you on which Federal could help?

### THE FEDERAL MACHINE & WELDER CO.

ELECTRIC WELDERS OF ALL TYPES

Factory and Home Offices: Warren, Ohio

**Sales Offices:** Buffalo—2006 Rand Bldg.  
Chicago—9 S. Clinton St.  
Cleveland—2036 E. 22nd.

Detroit—2832 E. Grand Blvd.  
Los Angeles—Smith Booth  
Usher Co., 2001 Sante Fe Ave.

Philadelphia—Bourse Bldg.  
Worcester, Mass.—Taylor-Hall  
Welding Corp.

New York City—Room 569, 50 Church St.  
St. Louis, Mo.—Halpin Co.,  
4116 Clayton Ave.





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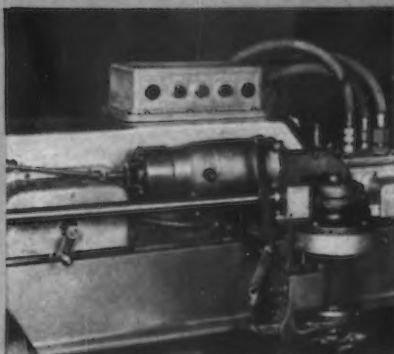
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*Close-up of front operating panel. Practically every operation of the New Oxweld Shape Cutting Machine can be controlled from this position by the operator. "Start," "Stop" and "Reverse" push buttons for the motor with automatic warning lights; cutting oxygen "On and Off" valve; motor speed dial for setting the motor to operate at any predetermined speed; 360-deg. calibrated dial for cutting at any desired angle; calibrated dials for cutting bevels horizontally or at right angles to the machine; tracer lifting and lowering lever.*

*Close-up of operating panel and controls at templet or tracing table. Motor push buttons, cutting oxygen, automatic speed control, and lever for tracer are also located in this position, in addition to hand tracing wheel.*



improved Oxweld Shape Cutting Machine. It is an outstanding addition to the large number of cutting machines developed to meet the specialized needs of the metal working industry.

### *Available from Linde*

The new Oxweld Shape Cutting Machine is available through all Linde Sales Offices. A call will bring a Linde representative with full details of this new machine. He will help you to form a comprehensive picture of its possibilities in your plant—without obligation.

Linde Sales Offices are located in thirty principal cities throughout the country and at 30 East 42nd Street, New York, N. Y. Address The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation.

## REVOLUTIONARY FEATURES ON THE NEW OXWELD SHAPE CUTTING MACHINE

Rugged crane type aluminum alloy carriage assures extreme rigidity and high degree of accuracy in cutting. The working mechanism is fully enclosed.

Dual controls, semi-automatic, give greatest flexibility, permit adjustments to be made at cutting blowpipe or at machine. Signal lights indicate whether machine is going forward or in reverse.

Cutting speeds range from 1½ to 90 in. per min. Speed of cut can be set on calibrated dial at front of machine or at motor if hand tracing device is being used.

Tracer lifting and guiding device can be operated at the blowpipe or at the tracing table.

Machine is quickly converted from automatic templet control to hand tracing.

Ball bearings on the carriage assure smooth, easy, frictionless operation.

Carriage can be locked for cutting straight lines, eliminating templets or other devices for such work.

Angular cuts can be made at any degree automatically. Pointer on calibrated scale of 360 deg., located on front control panel, can be set at any desired angle.

Blowpipe holder provided with calibrated pivots permits bevel cutting at any desired angle.

New cutting blowpipe has increased capacity. Cutting oxygen controls, independent of blowpipe, located in two positions.

Machine can be adapted for multiple cutting by the addition of blowpipes.

All electrical wiring is concealed in conduits. A plug connector at rear of carriage connects to power line.

Oxygen and acetylene are carried in brass pipes through blowpipe carrier arm, and terminate in hose connections at the forward and rear ends of the carriage.

Connections are provided for continuous water cooling of certain types of cutting blowpipes.

Safety stops prevent accidental damage to traveling blowpipe carriage.

## *Your Opportunity*

You can see the new  
Oxweld Shape Cutting Machine  
in operation at  
the UCC Exhibit  
Booths I-1, H-1 and H-2  
Chicago National Metal Exposition  
Chicago International Amphitheatre  
Sept. 30—Oct. 1-2-3-4, 1935



OXWELD WELDING AND CUTTING APPARATUS AND SUPPLIES  
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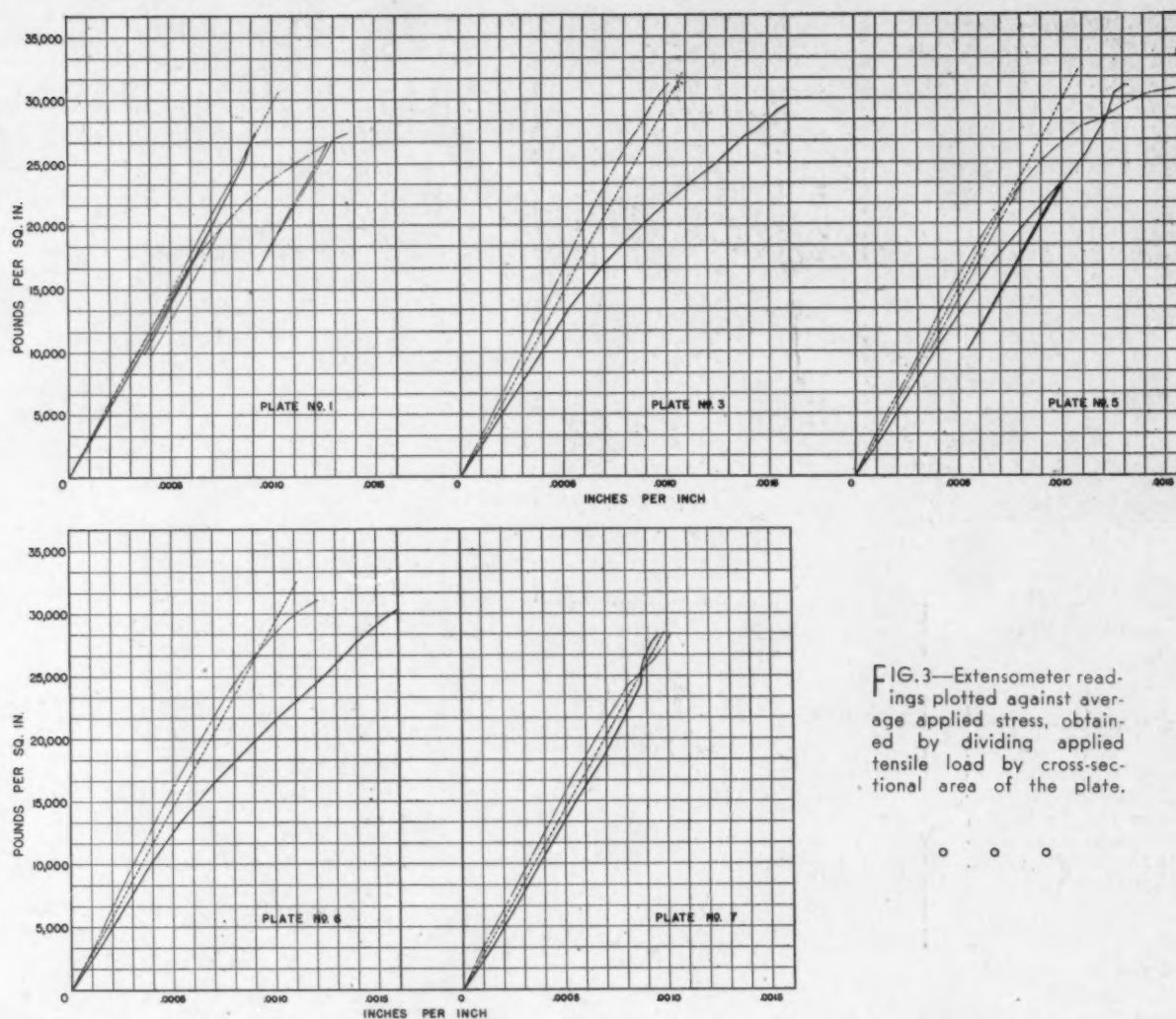


FIG. 3—Extensometer readings plotted against average applied stress, obtained by dividing applied tensile load by cross-sectional area of the plate.

(CONTINUED FROM PAGE 79)

unloaded and loaded again, as indicated on the graphs. Plates 3 and 6 were loaded once only. Where material was unloaded and reloaded, it shows in every case the characteristic behavior of overstressed material, the reload graph having a slope substantially that of material which has not been stressed beyond its yield point at average stresses well within the yield point for the normal parent material.

Owing to the use of wedge grips there must certainly have been some eccentricity of applied load in both the planes of the plate. Any eccentricity producing bending about the long axis of the cross-section is corrected for by the recorded means of the readings for a pair of extensometers. On the other hand, any bending about the short axis of the cross-section would give rise to a difference of values between these two means, or, on the graph, by a divergence of the graphs for the two gage lines. It is fair to infer that

this accounts for the arrangement of graphs obtained for plate 7.

The two gage lines of each welded plate showed great irregularity of strains, as shown on the graphs. Creep was very evident wherever the graph shows a decided decrease of slope, in many cases being noted on one edge while the other edge was still apparently elastic. In every case the yielding was greater on one edge than on the other, and failure took place by tearing, in three cases out of the four starting at the edge which had shown the smaller deformations before the yield.

In Fig. 4, the means of the strains for each plate have been plotted against applied average stresses, and a dotted straight line indicates the mean of the strains read on the unwelded plate. In every case the mean strain of the welded plate shows a progressively increasing divergence from that of the normal material, this divergence being evident at average stresses above 3000 lb. per sq. in.

The average yield value of the

normal material as determined from the tests on plates numbers 7, 8 and 9 was 29,700 lb. per sq. in., and the maximum residual stress measured was about 25,000 lb. per sq. in. Thus it would appear that the yield point would be reached at some point in the cross-section at a superposed stress of about 4700 lb. per sq. in.

In Fig. 5 the graphs of the strains throughout the test of each welded plate are shown, along with the dotted graph representing the corresponding strains of the unwelded plate. These are the readings taken from scale and pointer placed on one face on the center line of the plate. In each case the strain at the yield point was progressive for the welded plates, while it was abrupt in the unwelded material. After an increment of load was applied, the load was maintained constant and the strain reading taken only after all the strain for that load had taken place.

The ultimate strengths of the  
(CONTINUED ON PAGE 90)



# METALS



(CONTINUED FROM PAGE 84)

plates expressed in lb. per sq. in. of original cross-section were as follows: 49,900 lb. per sq. in. for plate 1, 48,300 lb. per sq. in. for plate 3, 48,200 lb. per sq. in. for plate 5, 45,900 lb. per sq. in. for plate 6, and 52,900 lb. per sq. in. for plate 7.

The average ultimate strength of the welded plates was 48,100 lb. per sq. in. The average ultimate strength of the welded plates is about 9 per cent less than that of the unwelded plate.

The welded plates all fractured initially by tearing from one edge. It is probable that a flaw or irregularity in the welding induced the

starting of a crack. The fractures indicated perfect penetration of the welding to the root of the groove. The fractures were irregular. Therefore measurements of elongation were not very satisfactory. However, it was most marked that the elongations were materially less than that of the unwelded plate. The relation was of the order of 12 per cent for the unwelded plates to 33 per cent for the normal material.

### Conclusions

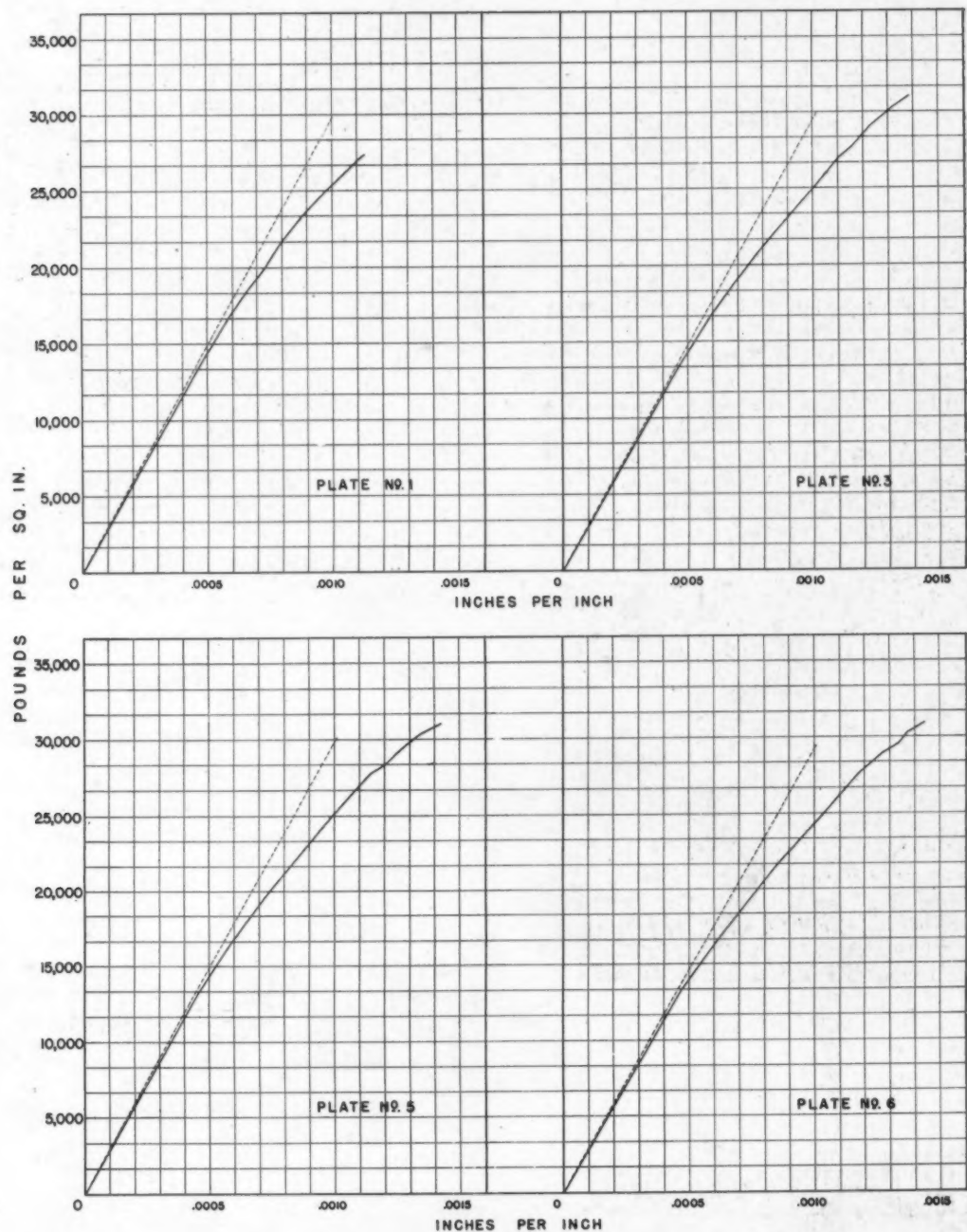
The presence of the rather high local residual stresses which have been observed exert a marked influence on the behavior of the

specimen under static tension loading. The variation from normal, as indicated in the stress-strain characteristics, are in evidence practically from the beginning of loading, thus indicating the presence of localized residual tensile stresses of magnitudes approximating the yield point of the material.

These rather high local initial stresses do not appear to have a serious effect on the strength of the specimen as a whole under subsequent static tension loading. Their presence gives rise to substantially larger average deformations than would occur in normal

(CONTINUED ON PAGE 92)

FIG. 4—Means of the strains for each plate plotted against average stresses. The dotted straight line indicates the mean of the strains read on an unwelded plate.







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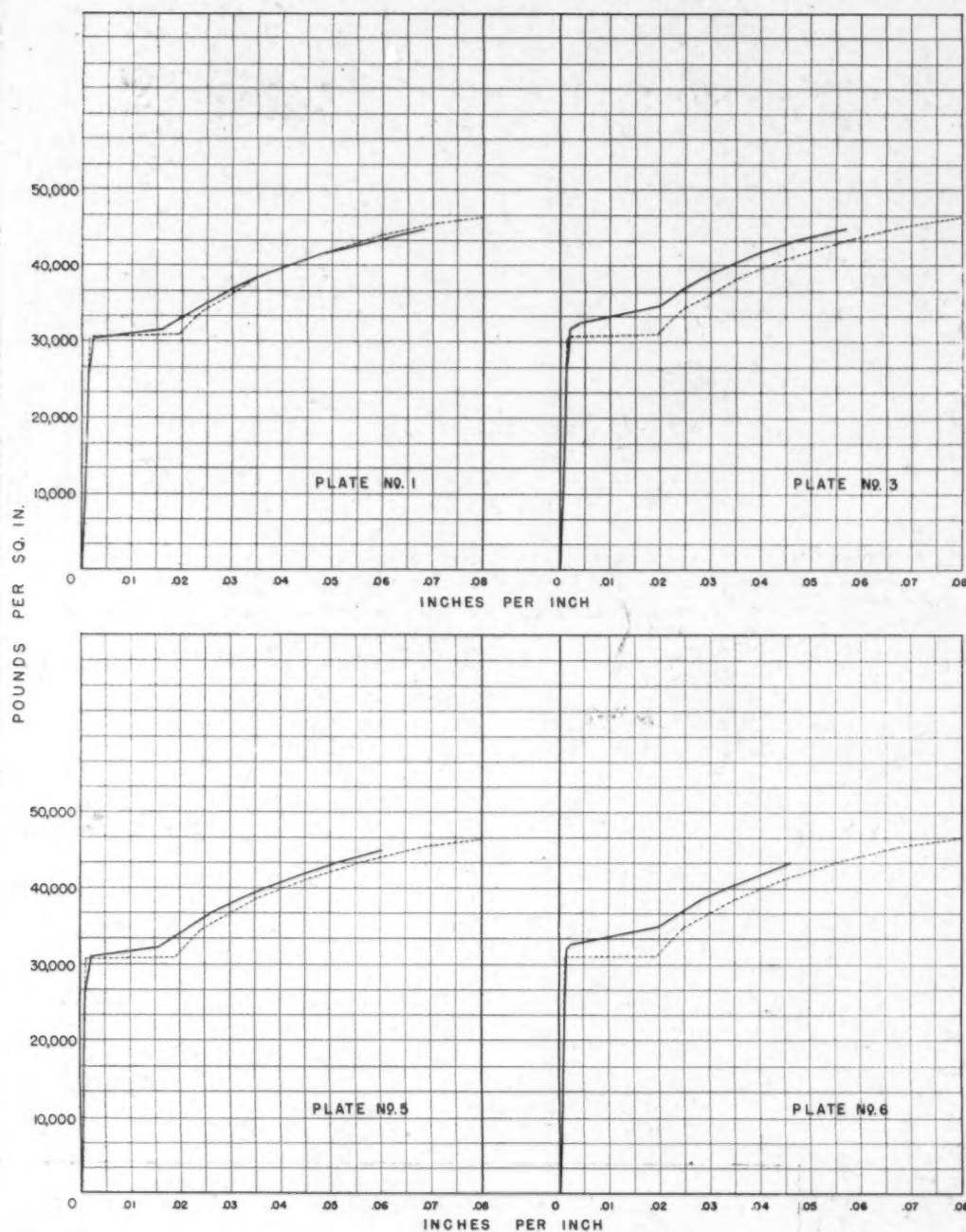


FIG. 5—Strains of each welded plate, as compared with the corresponding strains of the unwelded plate. In each case the strain at the yield point is progressive for the welded plates, while it is abrupt in the unwelded material.

(CONTINUED FROM PAGE 90)  
material for a given applied average stress. For example, at 16,000 lb. per sq. in. the stress observed averaged 4 per cent and at 24,000

lb. per sq. in. it averaged 15 per cent. This excess would occur only on the first application of load. During subsequent fluctuations of load up to the maximum value

reached, the material would behave as normal material of constant modulus.

The welding appears to raise the yield point and to lower the ductility of the plates. The reduction in ultimate strength, amounting to some 9 per cent on the average, may be ascribed in part to the manner of fracture, which was by tearing. It seems probable that this failure by tearing was largely due to the unequal distortions developed along the edges of the plates, and these inequalities in turn are due to the irregular distribution of the residual stresses across a section.

TABLE I

Recovery Data for Welded Plates 2 and 4

Strip	Total Shrinkage			Residual Stress		
	Plate 2	Plate 4	Mean	Plate 2	Plate 4	Mean
A	—	—27,600	—27,600	+24,200	+22,200	+23,200
B	—23,600	—24,000	—23,800	—2,800	—600	—1,700
C	—17,000	—15,500	—12,650	—17,100	—16,100	—16,600
D	—11,100	—8,700	—9,900	—11,000	—9,800	—10,400
E	—6,800	—2,400	—4,600	+3,000	+1,800	+2,400
F	—	—	—	+20,000	+15,800	+17,900



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# Nitrided Tool Steels

(CONTINUED FROM PAGE 45)

little grinding may be done after nitriding because the case is too thin, but lapping for finish is permissible. If the piece is correct before nitriding and is free from internal stresses, no deformation during nitriding should occur.

P. R. K. is a corrosion-resistant steel belonging to the rustless high-chrome steel class, and resists many chemicals and acids. Extended tests have not as yet been made on the corrosion resistance in its nitrided state, but there is undoubtedly an improvement for certain uses. A large variety of tools and materials made from this steel is shown in the accompanying illustration.

The following examples of the successful use of nitrided Cobaltcrom P. R. K. steel are of special interest. In most of these actual performance cases the Cobaltcrom steel without being nitrided has surpassed ordinary tool steel. And after nitriding the performance has been even further increased.

The figures here given are based on the best information which the author has been able to obtain, although not verified by him in every case. It is interesting and significant that users seem very reluctant to give out facts regarding the performance of nitrided tool steels, apparently believing that they have hit upon a "trade secret" which gives them an advantage over competitors. Even the tool steel salesman is slow in promoting the idea of nitriding tools, as he finds the resulting longer life seriously cutting down his replacement orders.

In one plant dies and mandrels for cold-drawing small thin-walled seamless tubes of round, oval and other special shapes in low-carbon, high-carbon, and stainless steels, phosphor bronze and other alloys, are giving more than double the service previously obtained. Another user has had success with drawing and sizing dies for copper tubing.

Extrusion dies for chalk gave more than 500 hr. of service with nitrided P. R. K. as compared with 30 hr. using ordinary dies.

Swaging dies in a Langelier machine operating on stainless steel (18-8) gave 10 days of service as

compared with a previous performance of one day.

Deep-drawing dies for shells of aluminum, brass, etc., have had their life increased from about 200,000 pieces with P. R. K. steel un-nitrided to 350,000 pieces when nitrided. This latter performance was about eight times the life of dies made of oil-hardening manganese steels.

Stamping dies for parts made of mild steel strip have outlasted the tools previously used by about 25 to 1.

Drill jigs and bushings in a certain instance lasted 20 times as long as plain carbon steel previously used.

Reamers, taps, drills and other tools for cutting such substances as bakelite, mica, fiber, etc., have stood up well, where ordinary high-speed steel tools failed rapidly. Cutting such materials is notoriously hard on tools.

## Numerous Applications Cited

A saw used to cut slots in bakelite gave very unsatisfactory service when made of ordinary tool steel. The same was true even with high-speed steel. However, with Cobaltcrom steel, nitrided, the saws are running 30 to 40 times as long as the former steels had run.

Some users have preferred to temper the P. R. K. steel to about 58 C Rockwell before nitriding. This is especially true for punches where great toughness is desired. One such punch is reported to have operated continuously day and night for five weeks without failure, and speeds as high as 200 punches per minute have been ob-

tained. The increased life is particularly noticeable where the speed is such that overheating of the punch occurs. Certain hot die applications have also proved successful.

Meat cutter knives have stood up under actual operating tests for six months, whereas one month's service was formerly considered a very good performance.

Much remains to be learned regarding preferred compositions for nitriding tool steels and their use. Presumably, however, they should contain one or more of the following elements: Cobalt, chromium, tungsten, molybdenum, vanadium, and should retain desired high hardness after being tempered at as high as 1000 deg. F.

It is always well to test out any proposed application under actual service conditions. Usually the cost of such trial is slight, involving merely the addition of the nitriding treatment to the tool which has previously been found reasonably satisfactory in its ordinary heat-treated condition.

Suggested applications, most of which have been successfully tried, include the following: Automotive valve parts at elevated temperatures; balls or rollers for bearings at elevated temperatures or other severe service; cams and camshafts for high pressure; coining dies; cutting tools for fiber, bakelite and other non-metallic materials; cutting tools for non-ferrous metals (especially milling cutters, reamers, etc.); die inserts; dies for cold drawing; drill bushings; expanding dies; extrusion dies for metals and non-metallic materials; forming dies; guides; mandrels for cold-drawing tubes; meat cutters; pivots; plug gages; ring gages; rockers; rolls and rollers; spindles; tappets; valve seats, guides and other parts, and wrist pins.

Composition and Physical Properties of the Well-Known Nitriding Steel  
Nitalloy G

<b>Composition:</b>	
Carbon .....	0.30 to 0.40 per cent
Manganese ...	0.30 to 0.60 per cent
Silicon .....	0.30 minimum
<b>Physical Properties:</b>	
Ultimate strength.....	150,000 lb. per sq. in.
Yield point.....	135,000 lb. per sq. in.
Elongation in 2 in.....	15 per cent
Reduction in area.....	50 per cent
Brinell hardness.....	300
Rockwell hardness.....	C-32





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# Further Notes on Open-Hearth Boils

By HENRY D. HIBBARD

Plainfield, N. J.



THE observations which follow are intended to supplement several articles on open-hearth boils which appeared in THE IRON AGE in 1925.\* These observations deal chiefly with the quantity and vigor of boils, their sources and effects.

By quantity of boil is meant, of course, the total volume of gases evolved from the bath throughout the whole operation of making the charge of steel. It is measured by the vigor of boil at each stage, multiplied by the length of time. The sum total of these amounts is the quantity in question. The intensity or effectiveness of certain of the functions of boil, as a part of the steel-making operation, may be in proportion to its quantity, or to its vigor, or to both. The right quantity of boil is particularly called for when gases are to be evolved from the metal in the mold, as in making rimming steel. When they are to be kept in solution it may not be so important, though the effect of gases so dissolved, or any of them, on the properties of killed steel is not now known. They doubtless do have an effect.

The essential element of boil is the formation and escape of carbon-monoxide gas formed by oxidation of carbon in the bath metal. When no carbon is being oxidized there is no boil, as none of the other gases in the metal is able to escape by itself. A possible exception to this rule is when the bath temperature is being rapidly lowered from an excessively high point, in which case dissolved gases from the metal may escape even when no carbon-monoxide is being formed. In pouring a sample in a test mold, unless the metal is killed, such an escape of gases takes place freely as the metal cools.

\*Copies of these articles are obtainable from the author.

The vigor of the boil is the measure of the rate at which carbon is being oxidized, modified as it may be by the presence of gas solvents in the metal and by the bath temperature. For a brisk boil, which is proper for most steels during decarbonization, when the metal contains 0.20 per cent carbon or more, silicon in the metal must be under 0.02 per cent and manganese preferably under 0.10 per cent. Any silicon present which is oxidized will not check the boil. In limiting the vigor of boil, residual silicon from the charge materials is far more potent than added silicon—0.03 per cent residual may quiet the boil as much as 0.15 per cent added.

To obtain a brisk boil, ore or other oxide of iron must be added freely to the slag, from which it is taken up by the metal when it does most of its work, with the exception of that along the plane of contact between the slag and metal of the bath.

The gases which escape as boil are (1) a part of those contained in the charge materials—particularly those in the crude iron, together with (2) those absorbed by the melting charge, and (3) those formed by the reactions. Hydrogen and carbon monoxide constitute the great bulk of these gases. It is probable that any water vapor which contacts with melting iron, such as scrap, is decomposed and absorbed. Its oxygen forms an oxide of iron while its hydrogen enters the metal. Gases in any ordinary steel scrap included in the charge materials are not important as contributing to the boil, for the finished steel will presumably contain about the same amounts. So there is no surplus to escape in the boil. Gases in the crude iron of the charge are probably of great importance, both as augmenting the boil and as calling for elimination down to manageable remainders. To effect this elimination is one

of the aims of the steel-making processes.

## Gas Extracted From Iron

At steel bath temperatures any of the gases which cause boil are expanded in volume by the heat to five or six times their volumes at atmospheric temperatures, thus enhancing the vigor of the boil.

Parry reported in 1881 that he had obtained great volumes of gas from gray cast iron by heating it *in vacuo* to various degrees below fusion. The hotter it was the more gas was evolved. For six hours at dull red heat, presumably about 600 deg. C., he obtained 21 volumes of gas, about 90 per cent of which was hydrogen. At bright red heat, perhaps about 750 deg. C., gas was again rapidly given off for about 12 hr. When heated yet hotter, more gas was evolved. He said, "Gray iron, heated for 165 hr., gave 205 times its own volume of hydrogen and 135 times its own volume of carbonic oxide." Had he raised its temperature to—but not above—its melting point, the amount of gases evolved might have been yet greater. He noted that at the lower temperatures hydrogen came off the more freely while carbon monoxide was more plentiful at the higher.

This extraction of gases from crude iron when it is heated is noteworthy for being just the opposite of their behavior in melted steel, from which they or some of them are evolved as the steel cools.

Parry does not state how much gas would have been given off at atmospheric pressure. However, under such pressure a considerable part, perhaps the larger part, would not have been evolved.

Parry tells nothing about the gray iron he investigated. However, it may be safely assumed that he considered it to be of an ordinary grade. The hydrogen which he extracted was about 1025 cu. ft.

(CONTINUED ON PAGE 104)





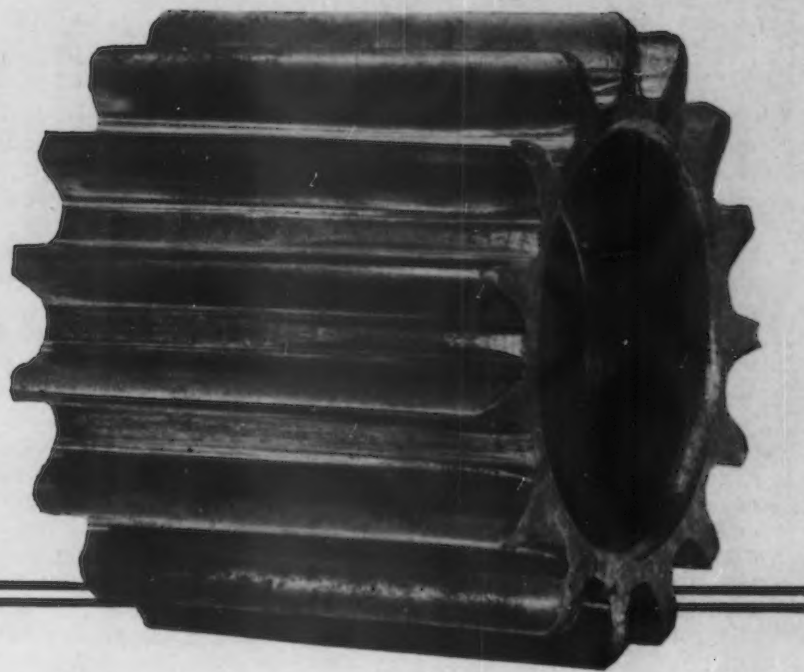
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# Further Notes on Open-Hearth Boils

(CONTINUED FROM PAGE 98)

per ton of iron, which would weigh about 5.7 lb. The carbon-monoxide was about 675 cu. ft. or 53 lb. per ton. At steel bath temperatures these gases would be expanded about six times or to a total volume of about 10,000 cu. ft. per ton of iron. What proportion of crude iron gases would escape as boil is unknown, but they must contribute much to its quantity and vigor.

Assuming that a bath metal when first melted has 0.50 per cent of carbon to be eliminated by oxidation, that would form 26 lb. or 334 cu. ft. of carbon monoxide per ton of metal. That amount, also expanded six times, would form 2000 cu. ft. of hot gas to escape as boil.

In Parry's day hydrogen had not been liquefied. Because of the manner in which it changes places, as it were, with many of the metals in chemical reactions, it was commonly, though wrongly, supposed that it was a metal itself allied to magnesium. Parry therefore assumed that in iron it was alloyed therewith, which accounted, in a way, for its hold on the metal.

The gases of crude iron are taken up by the molten metal in the blast furnace, presumably because of the silicon it contains. That element in molten iron gives it strong power for dissolving gases, particularly for hydrogen. From white iron, which contains relatively but little silicon, Parry obtained only a comparatively small quantity of gas when it was heated.

## Bessemer Steel Investigated

Molten steel contains large volumes of gases under atmospheric pressure which, unless retained in the metal by gas solvents, would escape proportionately if that pressure were to be lowered. This has been demonstrated by Bessemer and others. In 1914 Baraduc-Muller reported that, at the Ougree Steel Works in Belgium, he obtained, in dry weather, 20 volumes of gases from liquid soft basic Bessemer steel, under a nearly perfect vacuum. A large portion of these gases would normally have been left in the solidified metal. The evolved gases were mostly hydrogen and carbon monoxide, and their volume was about 1/17 as

much as Parry obtained from gray iron. Assuming that 40 per cent of an open-hearth charge is made up of crude iron of Parry's variety, about 17 per cent of its occluded gases would be retained in the metal at the end. The other 83 per cent would be liberated as boil, along with the other gases absorbed during melting and those formed by the reactions.

"In damp and rainy" weather, Baraduc-Muller got substantially more gas, which increase he considered to be hydrogen from decomposed water vapor in the air. As his steel was soft basic Bessemer, conclusions drawn from his investigations may not apply in all respects to open-hearth steel, though they are highly suggestive.

Muller showed in 1880 that carbon monoxide is but slightly, if at all, soluble in plain or simple solid steel. Therefore, substantially all of the carbon monoxide formed in the bath metal must escape either as boil or in the mold (as it does in rimming steel), unless it is held in solution in the metal by added silicon, aluminum or some other solvent. Hydrogen, being more soluble is only partly boiled out. It seems not to be able to escape freely by itself from the bath metal, but may be and probably is carried off to a considerable extent by the carbon monoxide as it boils out. Some of the other gases in the metal, including carbon dioxide, nitrogen and ammonia may also be carried off more or less completely by the boil.

In carrying off hydrogen or other gases, the vigor of the boil may be important. It is conceivable that a gentle boil over an extended period might fail to do it effectively, while a brisk or strong boil would do so, even with the same total quantity of boil in both cases. So, particularly in making rimming steel, the vigor of the boil must be adequate as well as its quantity—a brisk boil leads, of course, to faster driving than a gentle boil.

To insure a suitable boil in making rimming steel the bath metal should not contain too much manganese at the end. This element tends to quiet the boil. Perhaps 0.10 per cent of manganese at the end of the heat should not be exceeded.

The vigor of the boil may also be slackened by too little oxide of iron in the slag, or by a too high bath temperature or by both.

When, in making rimming steel, too much hydrogen is retained in the metal, skinholes, in the formation of which it is the principal agent, are too plentiful in the ingot and are located too near the surface, though such location is due more directly to the charge being too hot when tapped. Skinholes should be kept at a minimum, their zone extending not over a fourth of the ingot height up from the bottom. In addition, these holes should have a primary skin of solid steel at least 1 in. thick on the outside of them. When they occur higher in the ingot than this, or are nearer the surface it is presumably because of inadequate boil of the bath, provided, of course, that the metal be not too hot for casting.

## Gas Holes Related to Boil

Assume the charge of rimming steel, when tapped, to be right as to composition, degree of oxidation and temperature. Then, as it cools in the mold, and because of such cooling, it sets free its carbon monoxide at all stages as the mold is being filled. This carbon monoxide rising in bubbles causes the essential churning action of the metal. The liberation of hydrogen from the cooling metal begins later, as its saturation point is passed. The bubbles of carbon monoxide start to form at or near the bottom, and increase in size as they rise, both from accretions and from diminished pressure of the metal. So the agitation of the metal is graded according to the height from the bottom, being greatest at the top. The hydrogen bubbles, when they form, cling to the solidified ingot walls. Those near the bottom where the agitation of the metal is comparatively gentle remain there as skinholes. Higher up the motion is violent enough to dislodge them and they rise to the top and escape. The upper part of the ingot is therefore freer from gasholes than the lower.

Insufficient quantity of boil may possibly be the reason why good rimming steels containing more than 0.30 per cent carbon are not easily made. The lack of boil which would be caused by the oxidation of an extra 0.20 per cent

(CONTINUED ON PAGE 108)











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CHICAGO  
Monroe & Jefferson Sts

## Further Notes on Open-Hearth Boils

(CONTINUED FROM PAGE 104)

of carbon may lessen the useful functions of boil noted herein. Perhaps, in making such steels, there should be more crude iron in the charge to give the proper quantity of boil. This needs demonstration, however.

In partly killed steel ingots the greater or lesser quantity of gas-holes may be due to lesser or greater quantity of boil. This also demands investigation.

The gaseous requirements for making good ingots of rimming steel are therefore, first, a concentration of hydrogen in the metal so meager when the charge is tapped that its saturation point will not be reached until the solidified ingot shell is 1 in. thick and, second, an adequate evolution of carbon monoxide in the mold. To help secure these is one of the functions of the boil of the bath, which must be appropriate.

In spite of the great calorific power of hydrogen when burnt by oxygen, these elements seem to

have no power to combine when both are dissolved or emulsified in molten iron. It is a case of chemical affinity being neutralized by conditions.

Knowledge is wanted of the gases in crude irons used in steel making, as to quantity and composition, both as it leaves the blast furnace and in the cold pig. Particularly is knowledge wanted of the furnace practice which causes or controls their sources, formation and quantity. Gases are evolved from molten crude iron as it cools; so when added direct to the steel charge, molten iron adds gases to the bath metal, which cold pig of the same composition does not. More boil may therefore be required when direct metal is used in the charge.

The first examination or trial to be made is naturally as to the effect of dry air supply in the blast furnace, the converter and the open-hearth furnace (Siema). The points observed in the trials of

Gayley's dry blast, aside from the cost, were temperature and output. The effects, if any, on the occluded gases in the product were not considered. Yet they may be and probably are of great moment.

Some day, presumably, a hygrometer will regularly be included in the apparatus for making iron and steel. Then, in the open-hearth processes, unless the air introduced is dried, the quantity of boil will be proportioned to the moisture in the air, and hence to hydrogen in the bath metal which should be eliminated. To give that quantity of boil, the proportion of crude iron in the charge must correspond. The higher the humidity, the more crude iron, either molten or pig, will be included in the charge to give the quantity of boil ample for expelling excesses of other gases. A question arises, however, to which there is now no answer. Is the additional boil, from the oxidation of more carbon in more crude iron, more than enough to eliminate the additional hydrogen added in such iron? It may be and probably is.





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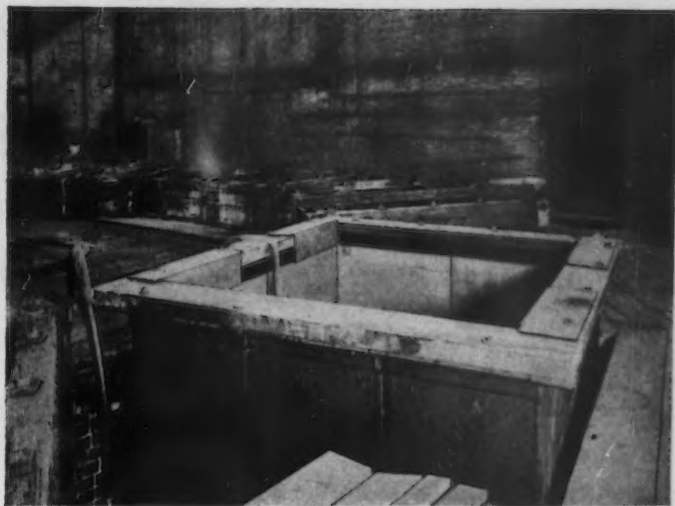
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# ACE M R-10 RUBBER TANK LINING



## SPECIAL APPLICATIONS

Rubber lined tanks used in steel mills for pickling should be protected against mechanical abuse.

We recommend, and for several years have used, a sandstone covering over the rubber lining, such as is illustrated, for this purpose. Our design of this sandstone covering, and method of holding it in place, have been perfected and this covering has given uniformly satisfactory results under the severest conditions.

The installation of the sandstone covering, under our recommendations, is always done at your plant. There is no expensive installation charge as would be the case when other coverings, such as acid-proof brick, etc., are employed.

## *These are the* **REASONS WHY**

you may expect greater service and longer life from tanks lined with Ace M R-10 Rubber Tank Lining:

- 1 SURFACE...** Glazed, smooth—impervious to corrosion. Easily cleaned.
- 2 SURFACE COMPOUND...** improved grade, pliable, non-permeable. Considerably better acid-resistance.
- 3 INNER LAYER...** between steel and rubber lining is high tensile soft rubber. Equalizes expansion and contraction. Cushions outer rubber lining.
- 4 BOND...** of inner layer of soft rubber to outer rubber lining and to steel tank is stronger than ever.
- 5 TECHNIQUE...** improved to include heavy, soft rubber fillets beneath the lining in all corners of the tank.



VISIT OUR BOOTH NO. L11  
NATIONAL METAL EXPOSITION—CHICAGO  
September 30 to October 4

**AMERICAN HARD RUBBER COMPANY**  
**11 MERCER STREET, NEW YORK, N. Y.**

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## ... Metal Cleaning Here and



AT first sight metal cleaning methods in Europe are somewhat different from practices in favor in this country. However, a close study reveals that procedures on both sides of the ocean are much the same in fundamentals. The same types of materials are used, and similar methods and equipment, which while differing in appearance and design, embody the same fundamental principles. Interchange of knowledge today is so facile and rapid, and current practices are so freely discussed in the technical journals that it could not be otherwise.

An article comparing European and American metal cleaning practices must necessarily be somewhat sketchy. Only highlights can be given on what has been seen and heard abroad. And American ears hear slowly and with difficulty in European factories.

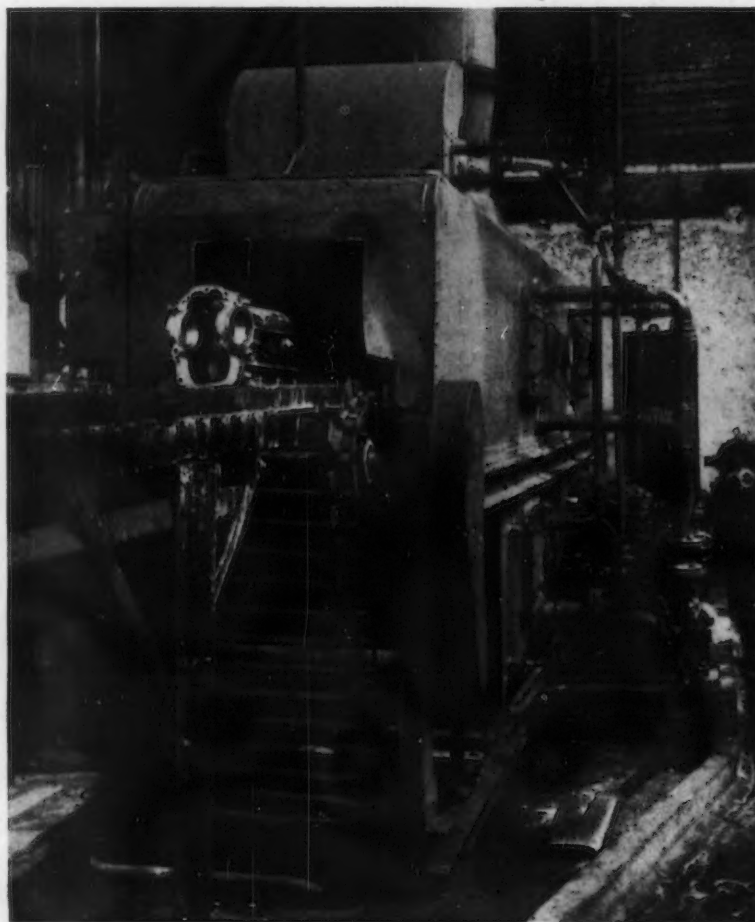
An American's first thought in visiting over there and seeing some of the European installations and equipment is, "why, that is a copy of what we have at home." However, in many cases it turns out that what we have at home really is a copy of what we see over there.

For the most part, the mechanical handling of work, as is necessary in mass production, is at a higher state of development and in more general use in this country than in Europe. But many of the mechanical ideas for metal handling or finishing which we have elaborated and developed to a high degree had their origin in European plants. Labor costs have always been a more important factor here and have tended to stimulate the development of labor saving equipment. There is no certainty about the location of the first metal washing machine. These machines have certainly been highly de-

veloped and extensively used in this country during the past decade. This is particularly true of the rotary, self-loading and discharging types, and of the conveyor type where washing, rinsing, dipping and drying are built into one sequence. The reverse is true of solvent degreasing machines which were extensively used in Europe long before they were introduced to this country. Steam gun and vapor cleaning equipment have reached a high stage of development in this country, being very

commonly known and widely used. But they are practically unknown in Europe. The steam gun becomes a *pistolet à vapeur* in France, and is an object of much interest. Tumbling and ball burnishing originated in British plants before 1900 and were brought to this country shortly thereafter. But in this country it has had a much greater development in elaboration of equipment, design, and application, and it is also much more extensively used.

An article in the August, 1933,





# and Abroad

BY R. W. MITCHELL

Technical Director,  
Magnus Chemical Co.

issue of the French journal *Galvano* on the subject of ball burnishing stated: "Born in England at the beginning of this century and later perfected in America, ball burnishing has had some difficulty in being adopted in France."

Our automatic equipment for handling, separating and drying during cleaning, rolling and burnishing without manual labor is in a class by itself. And there is at present considerable interest abroad in automatic equipment for handling work in cleaning and fin-

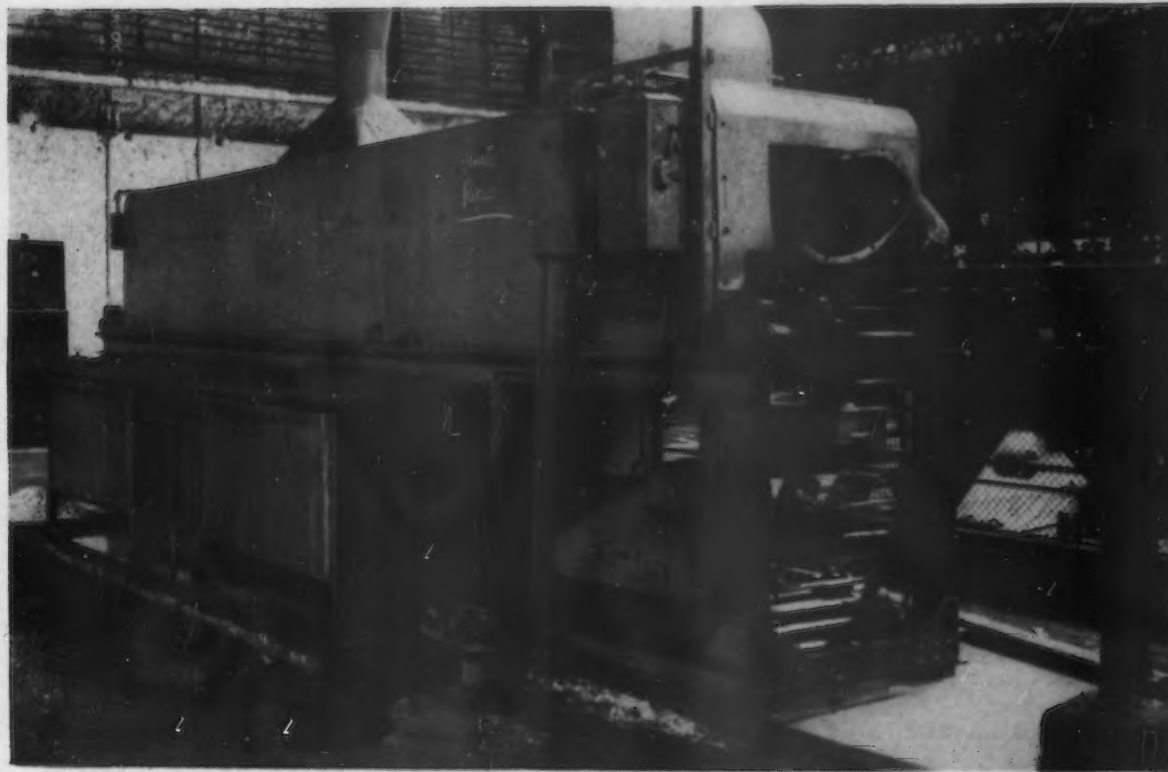
ishing processes, because of rising labor costs and keener competitive conditions.

The extensive use of the rosin type and of colloidal silicate metal cleaning compounds originated in this country. These types are finding favor abroad, where in many places the cleaning is still done ineffectually and under disagreeable working conditions with caustic soda. On the other hand, the new synthetic soaps, sulphated fatty alcohols, etc., which are just becoming known in this country, have

been in use for some time over there. Materials of this type, such as Lissapol, Igepon and Perminol, are more commonly used in Europe than in this country. An important reason for their wide acceptance abroad is that they are available at lower price levels.

True soaps, such as the alkali salts of the fatty acids, are much the same in both continents, the same types of soap stock being available. There is one exception. Naphthenic acid soaps have some

(CONTINUED ON PAGE 116)



TWO views of a French mechanical washing, rinsing and drying unit. Made by Mabor.

# BASOLIT *Pickling Tanks*



This is a three section 35 ft. wire pickling tank installed in 1933 in the Rock Falls plant of Russell, Burdsall and Ward Bolt and Nut Company under our patented Basolit Tank Construction method.

It is brick lined, with brick-veneered, reinforced, concrete outer shell. Basolit construction is also available with rubber lined steel tanks, a combination that has

shown excellent results in large strip steel installations.

Basolit Tanks are wear proof and immune against all commercial acids in steel pickling, and many have been in operation from five to eight years without any cost of maintenance or repair.

Our many years of experience are at your service. Write us for information.

**NUKEM PRODUCTS CORP., Buffalo, N.Y.**

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# Flexible Finish

## STANDS STIFF TEST

Metal strips for your inspection FREE on request



The photos illustrate the simple Abuse Tests we want you to make on finished metal strips we are more than anxious to send you. Write for these strips and the Bender Booklet. You'll learn about a one-coat, air-dry lacquer finish that gives remarkable results without a primer-coat, without baking. Available in BLAX or

any color—this lacquer of unequalled flexibility and adhesion, doesn't chip, flake or peel. It stands blanking and forming (a boon to small parts makers).

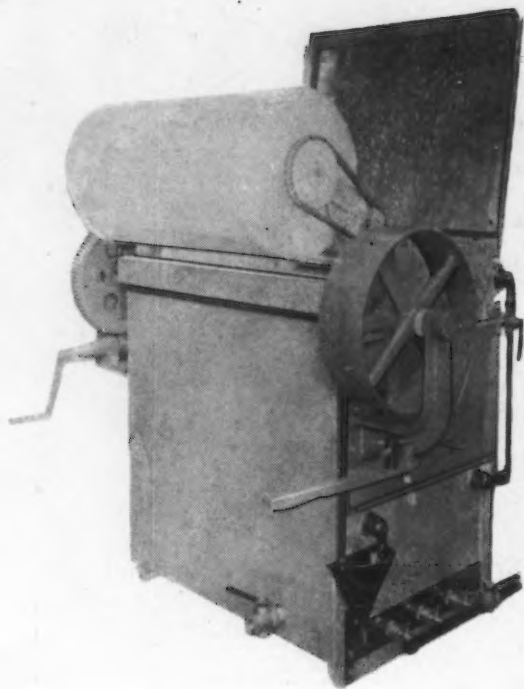
The Aging Test—two years in oven at 212°F.—produces no sign of brittleness. In assembling operations, the featured

toughness of these flexible finishes cuts down the rejects so frequently caused by tools that slip. This permanent resistance to chipping, flaking and peeling is what appeals to the metal working industries. Don't forget to write for the Bender Booklet and the finished metal strips. Write to Dept. 802.

ROXALIN FLEXIBLE LACQUER COMPANY, INC., ELIZABETH, N. J.

# ROXALIN Flexible FINISHES

CELLULOSE & SYNTHETIC TYPES ENGINEERED FOR SPECIFIC PERFORMANCE



TWO types of French degreasing machines.

(CONTINUED FROM PAGE 113)

use abroad but find no detergent applications here. There is a tendency to use soft soaps or potash soaps to a greater extent in Europe. They are very popular and commonly used in France and Germany where they are even still retailed in large volume for domestic consumption. Their use in this country for home use is practically unknown, and even for industrial work we use to a far greater extent the more convenient powdered or chipped soaps.

We have a considerable number of new solvents and new chemicals derived from petroleum which are in much more common use in this country and most of which are American contributions to chemistry. Some of these materials are well known in Europe, but are not commonly used because of their greater cost. Triethanolamine, for instance, costs about twice in France what it does here.

The number of new solvents available here is so large as to make listing difficult. Hydrogenated solvents from petroleum surpass the usual petroleum solvent naphthas in solvency power and compare favorably with coal tar solvent naphthas. These hydrogenated

naphthas are now available at very low prices. And they are available in different degrees of volatility, ranging from an initial boiling point of 365 deg. up to 779 deg. F., with flash points ranging from 60 deg. to 190 deg. F. Also, they have a mild and non-offensive odor.

From petroleum hydrocarbons there is being prepared an extensive list of alcohols, ranging through the low boiling propyl, butyl and amyl alcohols up to higher boiling members, such as octyl alcohol. Glycols and their derivatives, such as ethylene glycol-monoethyl ether and mono-butyl ether, and also the diethylene glycol monoethyl and mono-butyl ethers, offer further variety. This class of products is useful in preparing solvent soaps and mixed solvents, due to their solubilizing or blending abilities. Dioxan (diethylene oxide) is a remarkable new solvent with approximately the boiling point of water, which has the unique property of being both water soluble and a solvent for practically all vegetable and mineral oils, waxes, resins, etc. We have also high boiling ethers such as butyl ether (boiling range 278 to 290 deg. F.), dichlorethyl ether (boiling range 343

to 356 deg. F.), and there are also new high boiling ketones.

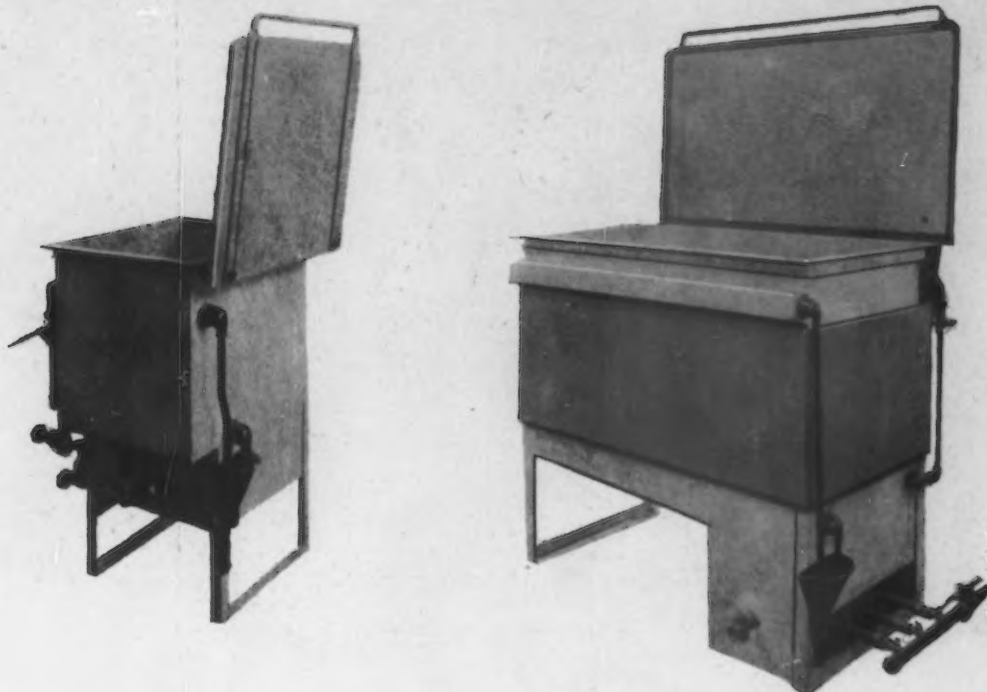
Pine oil which is extensively used in cleaning materials in this country is used very much less abroad. There the solvent cleaning is very generally done with chlorinated hydrocarbons used either as such or in emulsion. Turpentine finds only moderate usage.

#### "Cure All" Cleaner Still Sought

In general, cleaning methods in America demand complete cleaning or preparation of the metal surface for the finishing operations *en masse* without any hand labor upon individual pieces. This requirement is not so generally true abroad where production schedules are not as a rule on so large a scale and where hand labor is not at so much of a premium. There, in the small shops, and even in some of the large, it is common practice to do considerable hand scrubbing and hand wiping. This would still be done in many of our shops if they could afford to do it, for it undeniably gives excellent results.

In a recent article published in England, entitled "Modern Metal Cleaning," by Wright and Taylor,





TWO types of French degreasing machines.

the concluding paragraph is as follows:

"From a detailed study of the literature published on detergent

action, and from a knowledge of general plating shop requirements, the authors feel assured that the 'cure all' chemical cleaner has not

yet arrived. Scouring and mopping, and subsequent acid dips to remove the tarnish imparted by the clean-

(CONTINUED ON PAGE 122)

**OF VITAL INTEREST TO CONVENTION VISITORS  
and ALL WHO FINISH METALS—**

**—A simple, economical process**

*for coloring iron or steel surfaces at low temperature, by immersion, to a uniform and brilliant black.*

A complete finish in itself that will not chip, scale, peel or discolor . . . it replaces more involved and expensive black finishes.

An excellent bond for subsequent finishes such as japan, lacquers, varnishes, enamels, etc., that require high temperatures.

*Ask for descriptive circular and send samples to be JETALized.*



**ALROSE CHEMICAL COMPANY**  
*Executive Offices: 80 Clifford Street*  
**PROVIDENCE, RHODE ISLAND**

## THE TOUGH STEAK OFTEN LOOKS



## THE SAME AS THE TENDER ONE...

Care in selecting the steak certainly makes a lot of difference in the meal! And it's worthwhile to use care in selecting your cleaner, because

### THERE'S JUST AS MUCH DIFFERENCE IN CLEANERS

Since metal cleaning conditions and equipment vary so widely, the world's largest manufacturer of specialized cleaners has developed the group of Wyandotte Metal Cleaners. Among this group of specialized cleaners there is one that will solve your metal cleaning problem.

Ask for one of the Wyandotte Service Representatives. He will be glad to consult with you and recommend the particular kind of Wyandotte that will give the best results on your particular cleaning problem.



THE J. B. FORD COMPANY

WYANDOTTE, MICHIGAN

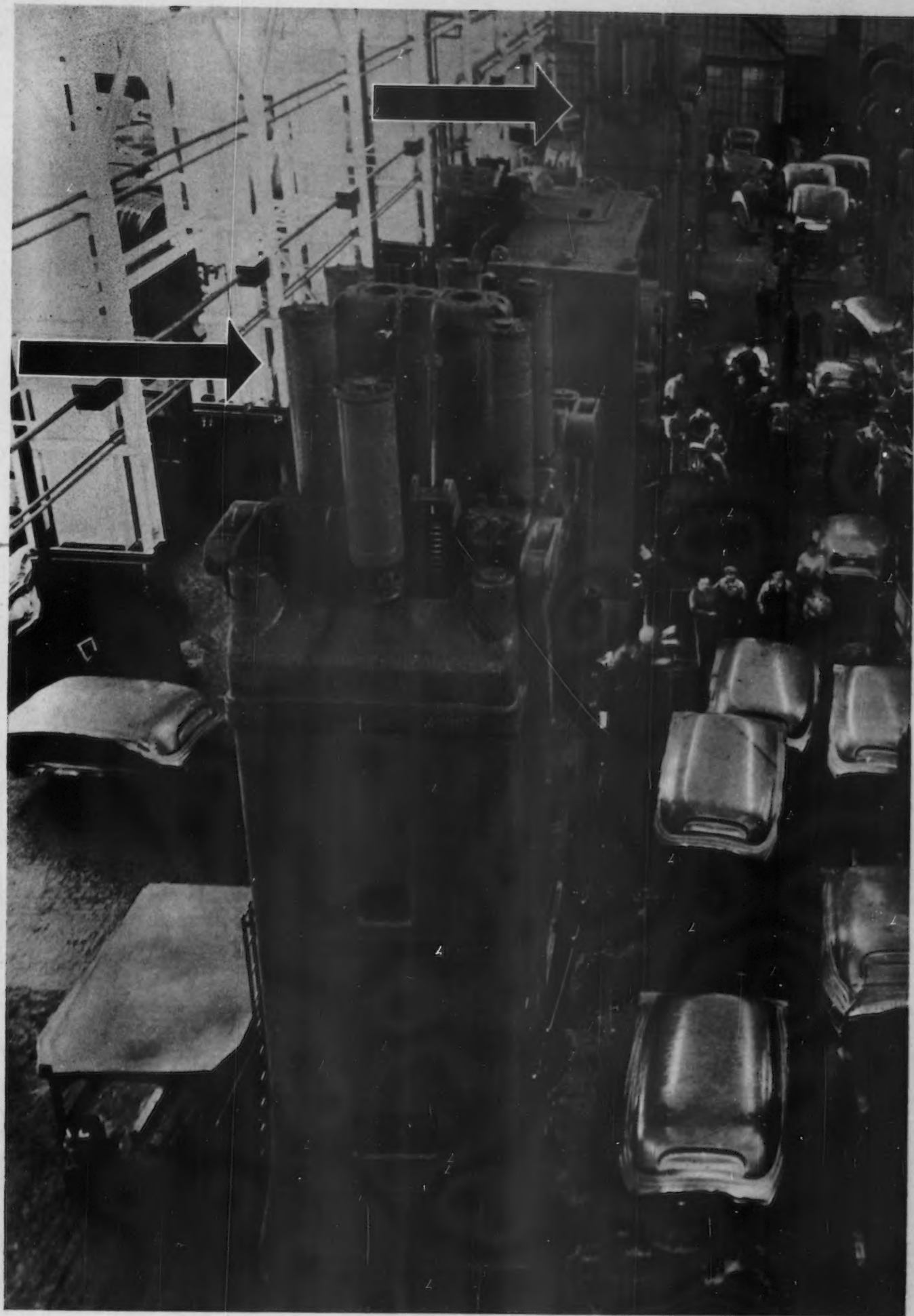
**Wyandotte**  
Clean "Chemically" Clean  
Metal Cleaners











(CONTINUED FROM PAGE 117)  
ing action, are likely to remain in general use in the smaller type of plating shop. However, where larger quantities of material, which have passed through similar shop processes, are available, a study of greases and dirt picked up in the course of fabrication makes it possible to devise a cleaning solution which is best suited for the particular type of oily dirt. Most of the materials of a detergent nature are well known, as are their physical and chemical properties, but far too little research and discussion have taken place as to the best mixture to employ and as to the optimum conditions for operation."

A new American method for solvent cleaning accomplishes certain difficult jobs in a better way than heretofore possible. This method is really a combination of solvent cleaning with the conventional method of washing and rinsing with water solutions. The idea consists in immersing dirty work in a solvent of high penetrative properties and which contains an effective emulsifying agent for this solvent in water. The solvent penetrates the oily dirt upon the work and

unites with it. It also wets the solid-particle dirt which is present, placing it, by reason of the dissolved emulsifying agents, in proper condition for immediate deflocculation and suspension when put in contact with water. It is used for what might be called a "pre-cleaning" operation in which the articles to be cleaned are dipped in the solvent or if the articles are too large for this they can be painted or sprayed with the solvent. The next step is a rinse, preferably a pressure rinse, which may be of cold water. This serves to carry off in emulsion a large proportion of the dirt present upon the surface.

Following the rinsing, the metal should go through the ordinary routine "Plater's Cleaner" and rinsing operations which usually precede metal finishing, if the metal is to be electroplated; for other finishes this is usually not necessary. This idea is just being introduced abroad. A similar idea, but using solvent emulsions of trichlorethylene or tetrachlorethane in products such as Westropole or Westoran, is well known in Europe. This type, however, al-

though tried in this country, has never proved popular excepting in the textile fields. The use of solvent soaps containing cyclo-hexanol and tetralin, and tetrahydronaphthalene, etc., has also had much more extensive application in Europe than in this country.

An interesting paper giving a good insight into Continental practice was presented by Dr. Hermann Stadlinger in the *Chemiker-Zeitung* in 1930. The abbreviated translation of this article which follows is of considerable interest.

"The metal industry today undergoes hardships in the same manner as other branches of our industrial life which have flourished in the past, and every works manager in the metal industry today is confronted with the serious problem of how to reduce further the cost of production and how to improve the manufacturing processes. These are the vital factors for the manufacture of goods that will stand the keen competition in world markets as regards quality and profit. These considerations explain why minor steps in produc-

(CONTINUED ON PAGE 126)

# Eliminate

## GUESSWORK AND TROUBLES

The many applications for which chromium can be used and the many types of deposits possible to obtain are problems that require specialization.



If you are having troubles with your Chrome Deposits don't resort to guesswork.

We can save you time—money—labor and worry by letting us analyze your problem.

Our engineering staff have for many years specialized in chrome deposits and are in a position to make an intelligent analysis of your conditions as well as make the proper recommendations.

Among our long list of patrons are some of the leading concerns in the country—Why not let us show you what we can do for you.

**The Hale Chrome Service, Inc.**  
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## MODERN ROLL TECHNIQUE

Purchasers of Phoenix Rolls have their judgement confirmed year after year by the performances of these rolls under severe operating conditions.

Modern roll technique as practiced by Pittsburgh Rolls insists that Phoenix Rolls be the best that can be made for the service required.

### PHOENIX ROLLS

PHOENIX STEEL, for unusual strength; PHOENIX "A" (steel alloy), for strength and wear; PHOENIX METAL—PHOENIX "K", for strength, wear and finish; PHOENIXLOY (uniformly hard), for flat rolling where high finish of extremely thin gauge of material is required to be free from all marks or defects. PHOENIX CHILL; PHOENIX NICKEL CHILL; for all flat rolling requiring finish. Also tube mill rolls of quality material best suited to the kind of service required.

**PITTSBURGH ROLLS CORPORATION**  
PITTSBURGH, PA.



(CONTINUED FROM PAGE 122)

tion are today subjected to scrutiny, especially in cases when these steps mean improvement in the manufacture. Such a step in the metal finishing industry is the cleaning and degreasing of metal parts from oil and grease, especially in cases when the metal pieces must for their further treatment be absolutely free of traces of grease and oil.

"As examples of this grease removal may be mentioned the enameling and the galvanizing industries, the painting of metals, also the metal finishing industry, as far as it employs oil and grease for the purpose of turning, boring, cutting or stamping of metals. A similar problem arises in repair shops where the tools and machine parts must be completely clean before being repaired, for the purpose of establishing defects even of the slightest nature, and before the latter are assembled. The coating in this case is of a nature entirely different from its original, for it has in the course of operations undergone changes or has been converted into resin, and the dust and dirt make removal extremely difficult. The various means in which industry accomplishes degreasing are manifold.

#### Degreasing Methods Abroad

"**PHYSICAL METHODS.** The first degreasing method to be mentioned is the procedure of burning off or 'glowing' the metal parts. This method degreases completely

but has the disadvantage of requiring considerable heat. Besides, depending upon the metal, there is danger of oxidizing its surface. Special precautions must be taken in preparing sheet metals for enameling, as insufficient 'glowing' does not degrease properly and the metal will show spots which will not take the enamel. Overglowing, on the other hand, may cause strong oxidation which is hard to remove in the subsequent pickling.

"Another method for cleaning metals in a mechanical way is the treatment of metal parts with wetted steel wool or wire brushes. The wetting liquid may be diluted solutions of organic acids, saponin, boring oil, etc. In case of preparing metals for further galvanizing, the scraping is then followed by polishing and matt-dipping. Finally may be mentioned the practice of boiling off in steam-heated vats, whereby the grease or oil separates from the metal parts, provided that hardening or resinification has not progressed too far; otherwise, the applications of chemicals will be required.

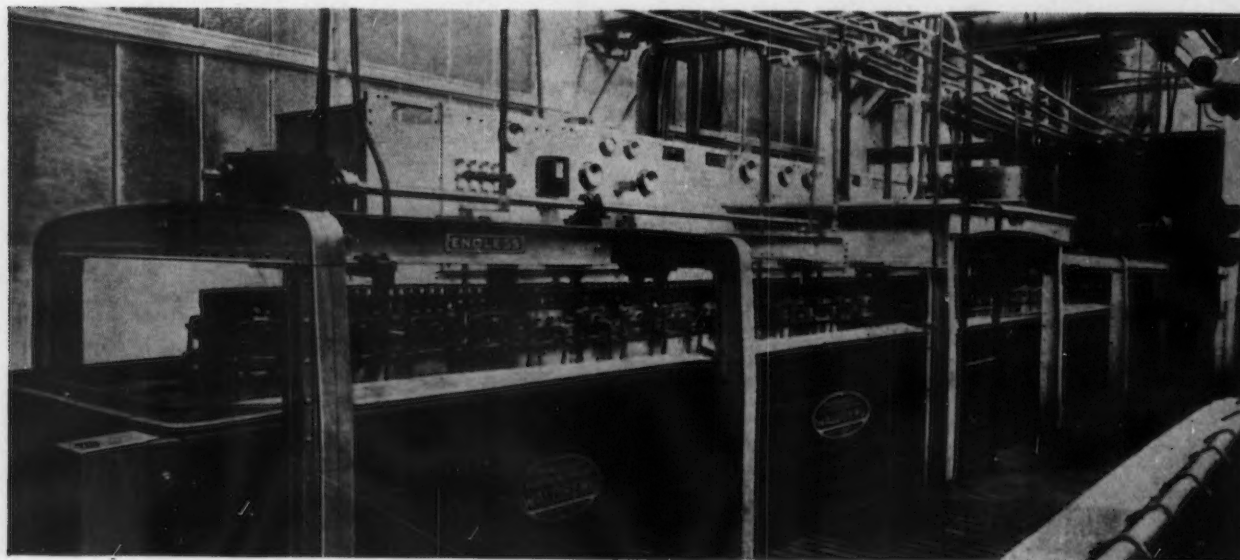
"**CHEMICAL DEGREASING.** In contrast with the above physical methods is the chemical cleaning, i. e., with substances which act as solvents, saponifiers or emulsifiers.

"(1) **Solvents.** Well known solvents having excellent degreasing properties are petrol (kerosene), gasoline, benzene, carbon tetrachloride and trichlorethylene. The disadvantage of the first three as

regards their inflammability is well known and needs no further explanation. Furthermore, it is the unpleasant fact that prolonged inhaling of petroleum spirit, and especially benzene vapors, is harmful to the health. The application of both of these solvents must therefore take place in closed degreasing and circulating vessels in the absence of air.

"The application of carbon tetrachloride and trichlorethylene has gained favor due to the absence of a fire hazard. For reasons of economy and hygiene, it is necessary also to work in closed and circulating vessels when using these chemicals for the purpose of avoiding loss of solvents and preventing harm to the health of the laborers. The danger of decomposition of the very expensive trichlorethylene under splitting off of acid, according to the process of die Gesellschaft für elektrochemische Industrie (Dr. Alex Wacker), München, which produces it in large quantities, is improbable. An attack on the heating coils takes place only when the steam pressure rises above 2 to 2.5 atmospheres. As trichlorethylene degreases quickly when boiling and inasmuch as its vapors are dangerous and disagreeable to laborers, it is necessary to carry out the cleaning operation in apparatus in which the vapors are condensed before they might enter the work rooms. The above mentioned firm is building complete operating 'tri washing installations'

(CONTINUED ON PAGE 132)



**C**HAIN conveyor nickel plating in the plant of André Citroën. The endless chain system is 33 ft. long, and the electrolyte capacity is 4755 gal. This apparatus is capable of depositing 111 lb. of nickel during a working day of 8 hr.





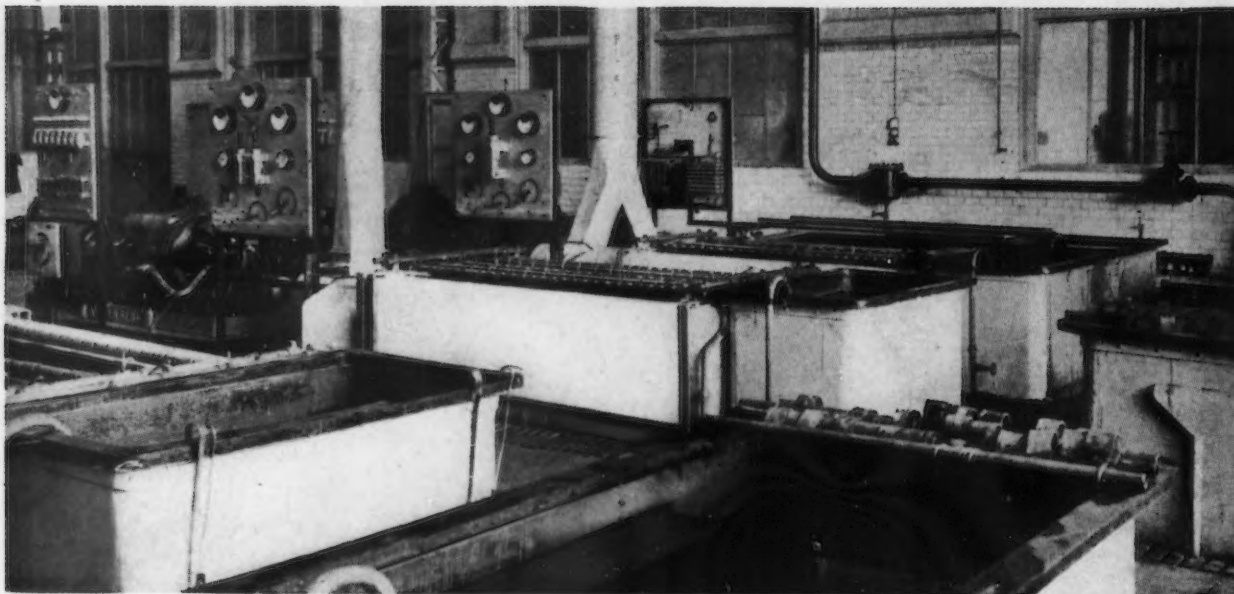






# FIRST AID TO METAL WORKERS

Boulton & Paul  
LONDON STEEL CO.



CHROME plating installation at the plant of André Citroën, Quai de Javel. This is Waldberg equipment. There are four converter groups, each of 2000 amp., and four chromium stands of 634-gal. capacity.

(CONTINUED FROM PAGE 126)  
which conform with the rules of hygiene.

**"(2) Alkaline Degreasing Agents.** These agents have in contrast to most organic solvents the advantage of being non-inflammable and evolve no vapors that are harmful to health. Nevertheless they are not entirely void of properties disadvantageous to health, as they may cause irritation of the skin and eyes. The main representatives of this group are caustic soda, a 10 per cent solution of which is usually employed for cleaning iron, steel, nickel and for other similar purposes. Furthermore, soda ash, silicate of sodium and a number of other products may be mentioned. Also worthy of mention are the soap-containing preparations which are compounded with organic solvents, for instance, hexalin, heavy gasoline, carbon tetrachloride and so-called solvent soap which function through the application of the finely divided hydrocarbons. These preparations are widely used.

"In judging the strong alkaline degreasing agents (caustic soda, alkaline silicates and others) a factor which is absent among the organic solvents must be considered, namely, the danger of corrosion for certain metals and alloys. Furthermore, tin, aluminum, aluminum-alloys, zinc or brass are more or less affected by alkaline cleaning agents.

"It is therefore obvious that

there is a need for proper cleaning agents for metals which, in the process of degreasing, are not inflammable, irritant to the skin and eyes, destructive to clothes and corrosive to metals.

**"(3) Emulsifying Degreasing Agents.** A proper combination of this type of agent are mixtures of silicates of sodium with trisodium phosphate. Such preparations are made by Henkel & Cie. and appear on the market in powder form under the name 'P 3,' for cleaning metals, glass and industrial textiles. That sodium silicate possesses considerable cleaning properties for metals was discovered during the war when, due to the scarcity of petroleum and turpentine oil, a search for new substitute degreasing agents for metals was inaugurated by the war industry.

"A large number of producers have mixed for that purpose silicate of sodium with caustic soda or potash and offered to consumers these solutions in very concentrated form, as disilicate and monosilicate. The great alkalinity of these solutions strongly affected the hands of the laborers. The results justified the technical effect of these preparations as noticed by me in my earlier practice in Chemnitz. The liquid form of these preparations was, however, a disadvantage. The new idea which the firm Henkel & Cie. placed recently on the market consists in combining the mild trisodium phosphate

with the sodium silicate instead of using the corrosive caustic soda. This action was taken after it had been seen that this phosphate in aqueous solution forms temporary emulsions with fats and oils and has a degreasing action. The emulsifying action takes place especially at boiling temperature and is not to be considered a saponification reaction.

"A half year ago when I first learned from the trade literature of the existence of this degreasing agent, I was in doubt as to whether this combination possessed more cleaning and degreasing properties than the usual sodium silicate, and I was highly surprised when I saw this product 'P 3' on exhibition in Leipzig in 1930 offered for sale. It was shown how machine parts, automobile and bicycle chains, wheels, valves and similar objects which were heavily covered with encrustations of oil residues for a considerable length of time regained a perfectly clean surface after having been treated with a hot 'P 3' wash.

"This undisputed success induced me to study the new degreasing agent. However, the fact remains interesting that there is a relation between the emulsifying action and the nature of fats. This relation was established by experiments on sheet metal, free of oxide and dirt. The surface was coated evenly with various oils and fats.

(CONTINUED ON PAGE 134)



# LEE- BUILT SPRINGS

**S**PRINGS may be overshadowed, when compared in size to other more massive parts in your assembly. But for long, continuous operation of the assembled machine—the smallest spring is just as important as the most massive part.

This requires skillfully-made springs, of better materials, built for your particular requirements.

Our modern plant is equipped with complete facilities for making, testing, and inspecting springs—operated by a competent staff of skilled and experienced workmen. Prompt deliveries—fair prices.

Send for the LEE SPRING SPECIFICATION FORM. It will assist you in writing your spring specifications.



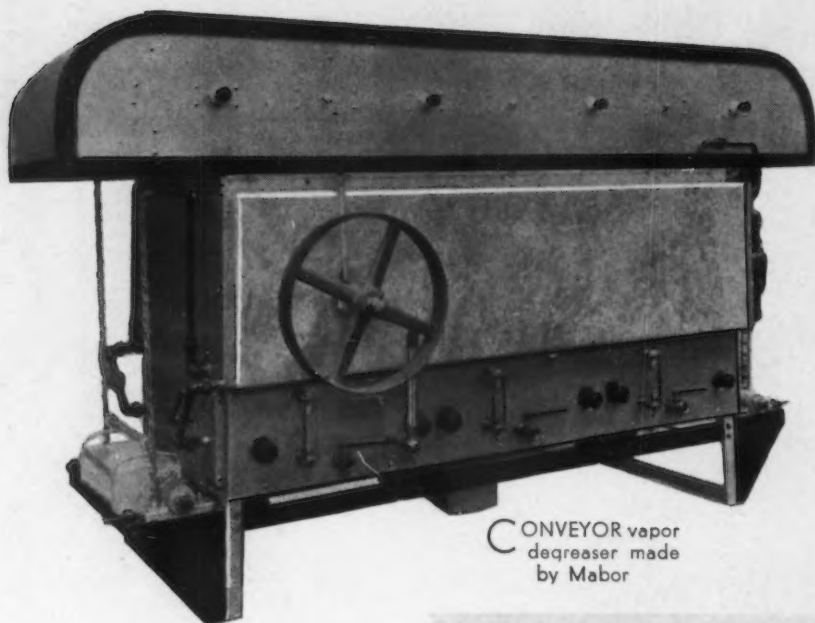
**LEE SPRING COMPANY, INC.**  
30 MAIN ST. BROOKLYN, N.Y.



Send Us Your "Lee Spring Specification Form"

NAME .....

ADDRESS .....



CONVEYOR vapor  
degreaser made  
by Mabor

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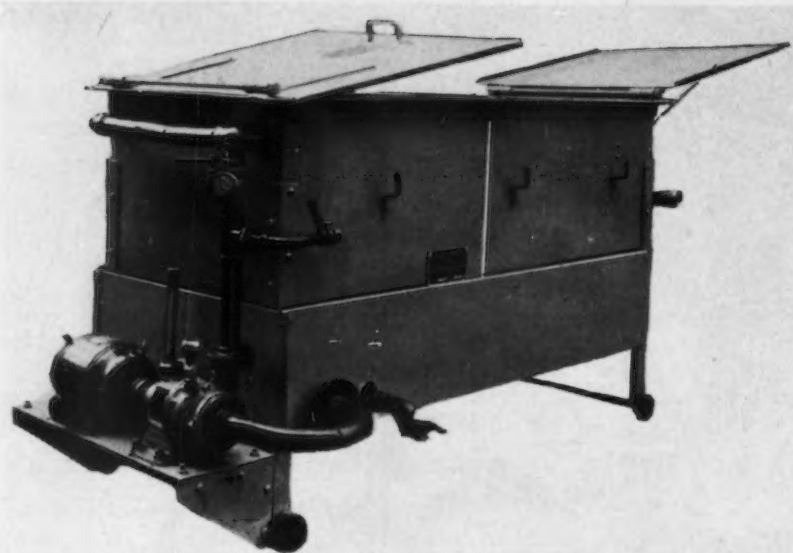
After exposure to the air for eight days, the sheet metals were submerged in a boiling solution of 'P 3' and the action of the solvent determined.

"For the removal of fat and oil films the following times were recorded: linseed oil required 6 min.; tallow, 6 min.; boring oil, 7 min.; train oil, 13 min.; mineral oil, 12 min.; soy oil, 23 min.; olive oil, 25 min.; rape oil, 25 min.; bone fat, 35 min.; Stauffer fat, 120 min.

"From this two facts are obvious: The time for degreasing varies within two limits. Some saponifiable oils and fats need under

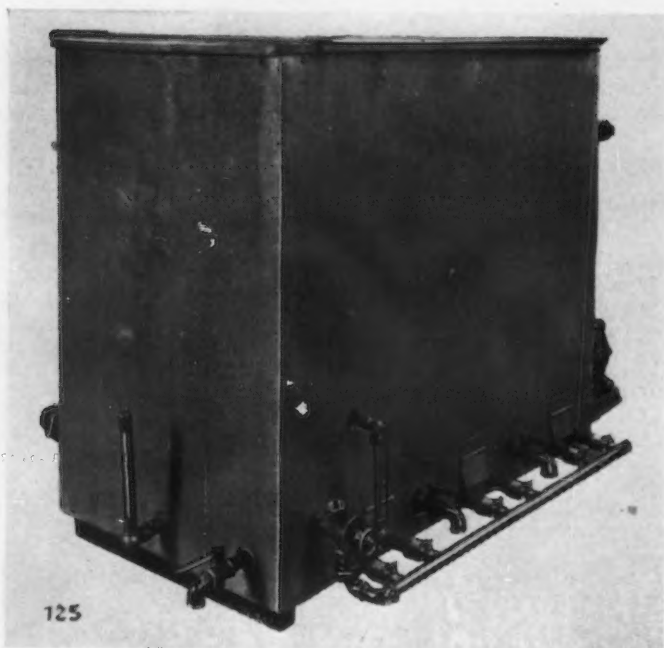
certain conditions longer boiling for the degreasing than mineral oils, wherefrom it must be concluded that the action of the 'P 3'-system, sodium silicate and trisodium phosphate is an emulsifying and not a saponifying one.

"Further experiments dealing with the action of 'P 3' on easily corrodible metals, especially aluminum, aluminum alloys, tin, zinc and brass, were carried out. Besides the ordinary 'P 3' which does not corrode aluminum, silumin, elektron and zinc, another 'P 3-Special' was placed on the market which has the advantages of not corroding such easy corrodible metals as tin plate, brass, duraluminum and lautal.



ABOVE  
PRESSURE  
spray machine in use  
abroad. This  
equipment  
may employ  
acid or alkaline  
solutions  
or solvents.

AT LEFT  
FRENCH  
type of gas  
heated tank  
for degreasing  
with an  
alkaline solution.



125

"Tests show the protective influence of 'P 3' cleaners. They also show the corrosive action of caustic soda and soda ash. Sheets of aluminum, silumin, elektron, zinc, duraluminum, lautal and brass were tried out, together with a 5 per cent solution of 'P 3' (only the lower half of each of the sheets was submerged, the upper half was not in contact with the boiling solution). These experiments showed that the metals and alloys were greatly affected by the 5 per cent solutions of caustic soda and calc. soda ash, whereas the 5 per cent solution of 'P 3' did not affect aluminum, silumin, elektron and zinc; the 5 per cent solution of 'P 3-Special' protected duraluminum lautal, tin plate and brass against corrosion.

"A few remarks about the appli-

(CONTINUED ON PAGE 141)





**T**

1310

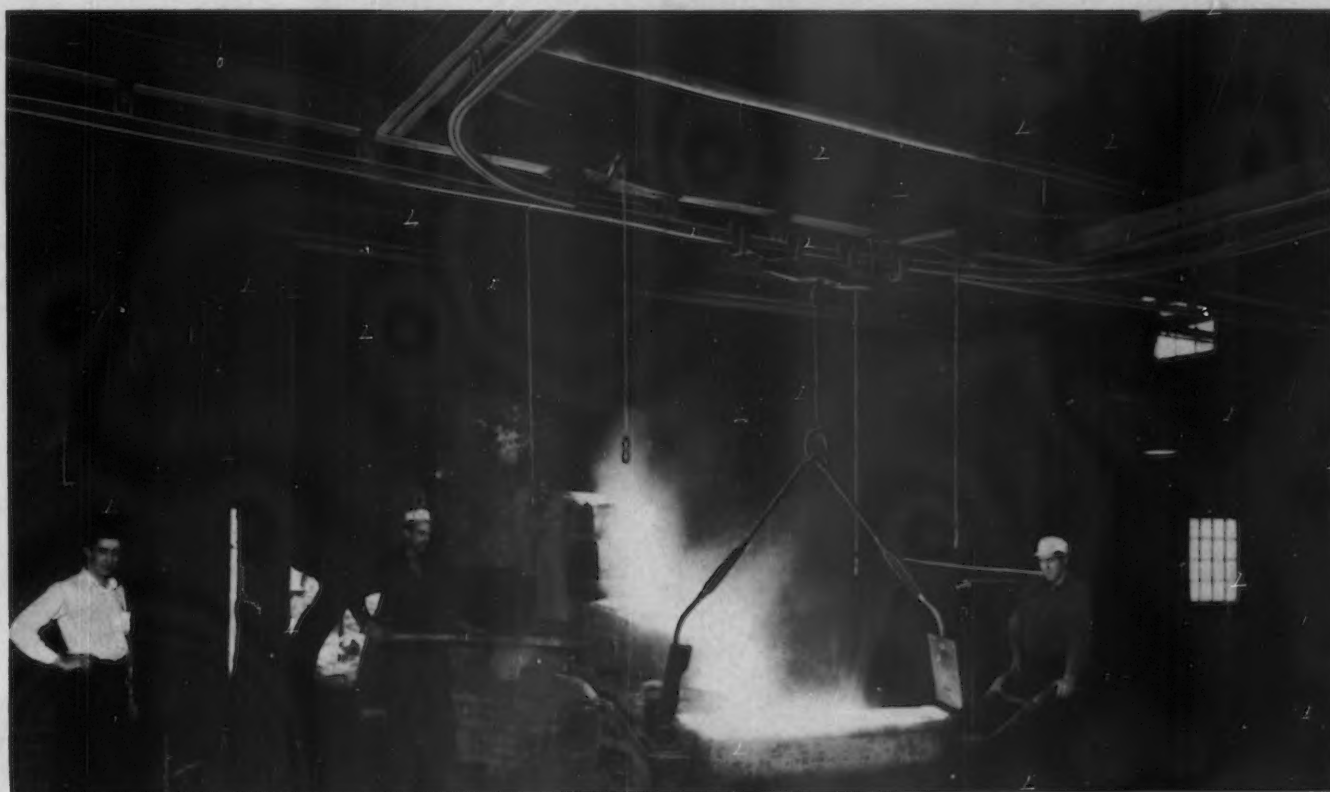


# THE AMERICAN MONORAIL COMPANY

13103 Athens Ave.

Cleveland, Ohio

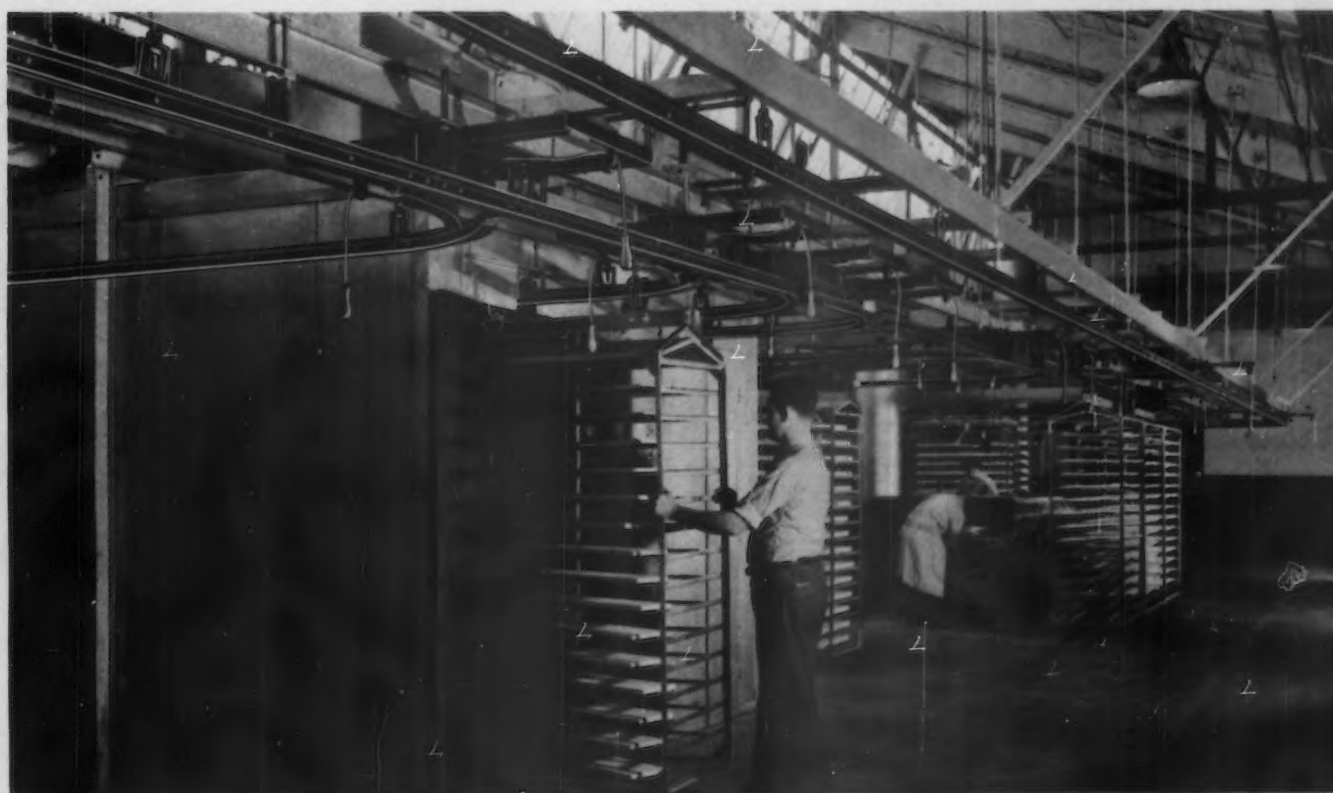
*Serving all Industry*



In thousands of plants, in every type of industry, MonoRail Tracks, Carriers, Cranes and Hoists, both hand and power operated, are cutting costs and speeding operations. One important reason is that this equipment covers a wider range of applications than any other type of conveying system.

American MonoRail systems are engineered and fabricated to fit the job. Standard units in stock for quick delivery. Special units designed to meet specific requirements.

Representatives in all industrial centers.



# THE SMALLEST ITEM OF THE B & L EXHIBIT

**N**OW, with the B & L new Grain Size Measuring Eyepiece (suggested by Dr. Marcus Grossman) determination of grain size becomes a simple routine procedure which rapidly produces accurate results. It is well worth coming to the show to see.

But this eyepiece is the smallest item in the entire B & L Exhibit. Other instruments of far greater importance will be shown. Here is a list of them.

- |                             |                        |
|-----------------------------|------------------------|
| *Ortho-Stereo Camera        | *Shop Microscope       |
| Spectrographic Equipment    | Wide Field Microscope  |
| *Ampliplan Eyepieces        | Toolmaker's Microscope |
| Metallographic Equipment    | Colorimeters           |
| *Electroplater's Microscope | Ultra Violet Optics    |

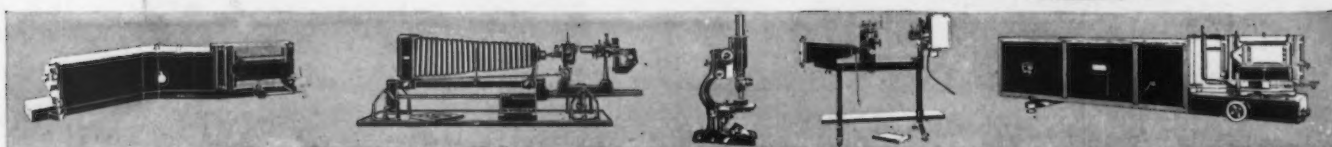
So, be sure to visit the B & L Booth No. A-27. If you cannot attend the show, write for complete details to Bausch & Lomb Optical Co., 621 St. Paul Street, Rochester, N. Y.

\*These are newly designed items.

*The photomicrograph (above) represents the view seen through the eyepiece (below).*



## Bausch & Lomb



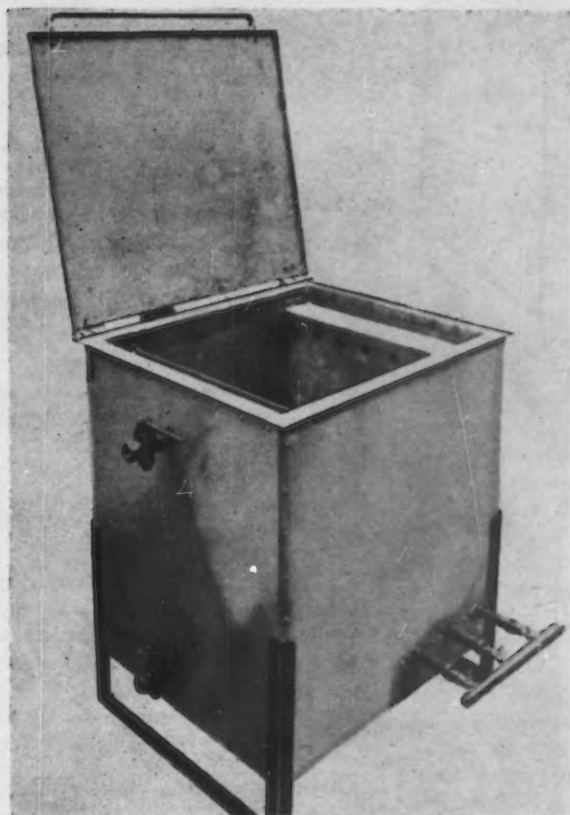
Medium Spectrograph, Large Metallographic Equipment, FSM Microscope, SI Metallographic Equipment, Littrow Spectrograph



## Metal Cleaning Here And Abroad

(CONTINUED FROM PAGE 134)

cation of these degreasing agents are of value. It has been verified that the cleaning fluid shows a good emulsifying action when it rapidly passes the metal to be cleaned. The motion of the fluid can be best carried out in the cleaning apparatus of Poensgen, Dusseldorf-Rath, or Golzern, Grimma, which are also provided with stirring and heating facilities. It is sufficient to maintain the fluid at 176 to 194 deg. F.



BELOW  
GERMAN type  
of solvent  
degreasing ma-  
chine. Note the  
typical elaborate  
detail and com-  
plexity.

A well known wash machine in which the metals are sprayed with the hot cleaning fluid is the Hydro-matikus made by Hahn & Kolb, Stuttgart. According to corrosion experiments, it is possible to treat metals with a 5 per cent 'P 3' solution without affecting them. In actual practice a concentration from 3 to 4 per cent is sufficient. In case of oils and fats, easy removable, a concentration from 1 to 2 per cent will suffice.

"The ground 'P 3' is a white powder which before use has to be dissolved in water. As it represents a silicate of low alkalinity, combined

AT RIGHT  
ENGLISH type  
of degreas-  
ing machine.  
Made by Im-  
perial Chemical  
Industries, Ltd.

BELOW  
LABOR clean-  
ing tank  
employing an  
aqueous solution.



with trisodium phosphate, no skin or eye irritation is to be feared. Even the vapors are harmless to health.

"From the above a comparative discussion of the various cleaning processes will confirm that 'P 3' represents a new process which will be welcomed by every works man-



ager. Its properties can be summed up in the following: it excludes fire hazards, it is harmless to health, it possesses excellent cleaning properties and it does not corrode metals."

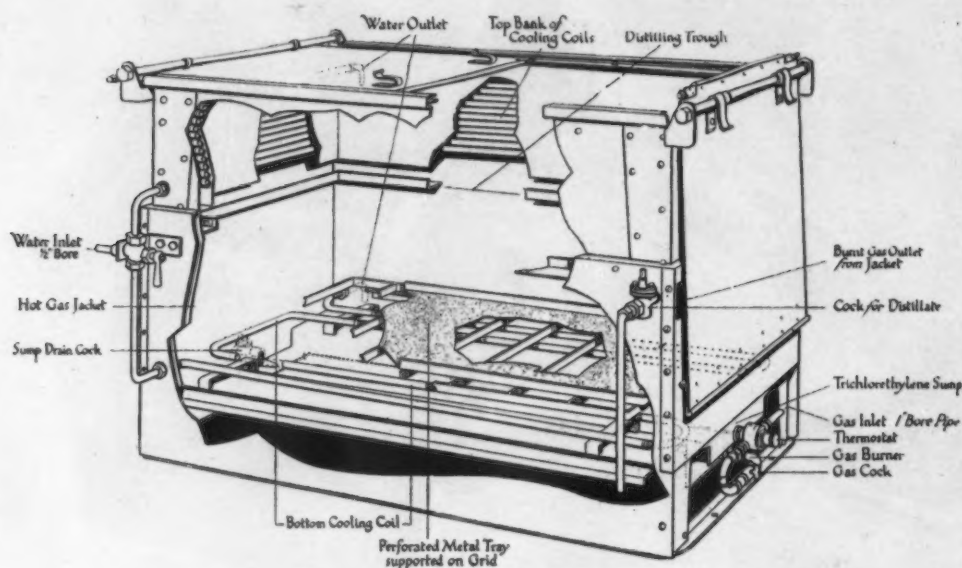
### "P 3" Available Here

The product "P 3," which is widely used in Europe, is of the same type as sold in this country as Magnus Metal Cleaner. It is not one material but a graded series of

The swing from cathodic to anodic cleaning of steel, brass and copper is much more general in this country. A recent French article on electrolytic cleaning states: "But we repeat, it is with a combined cleaning and coppering solution equipped with copper anodes that one has the maximum of security as far as adherence goes, with a few specific exceptions."

An abstract of an important paper on this same subject by R.

produced in degreasing should be removed by rinsing for 1 min. in 5 per cent hydrochloric acid, or 2 to 5 per cent sulphuric acid, and subsequently rinsing in clean water. Brittle deposits might be due to electrolytic degreasing which had been carried out too long or at too high current densities; this is particularly the case for nickel-chromium plating. Electrolytic degreasing should be done for 1½ min. maximum at 6 to 8 volts maximum.



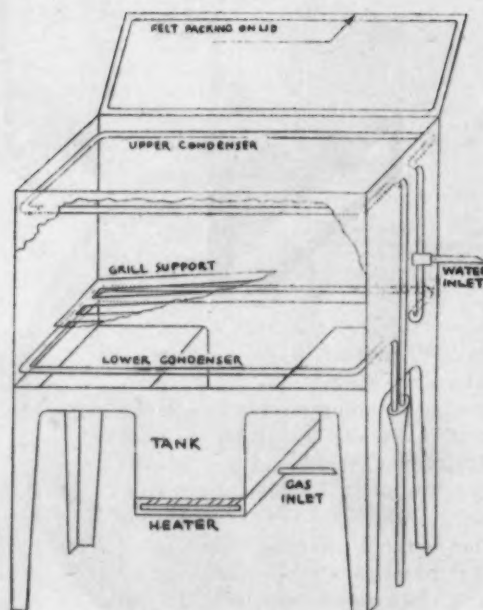
ENGLISH type of degreasing machine. This equipment is made by Imperial Chemical Industries, Ltd.

alkaline cleaners of varying strength to suit different requirements, and containing emulsifying agents added to the mineral ingredients.

Electrolytic cleaning, while still very generally employed in this country, is not given the importance recently that it formerly had. In an excellent review of the subject of electrolytic cleaning and pickling in the November, 1934, monthly review of the American Electro-Platers' Society, Walter Meyer states: "Provided grease removal is complete a non-electric cleaner will leave the work in a condition to obtain the best possible adhesion of the electro-deposit."

The process of electrocleaning and coppering in one operation formerly had considerable vogue in America, but has lately been used to less extent. It is still very commonly employed in France. A recent article in the journal *Galvano* discusses the pros and cons of this procedure in great detail, the conclusion being that the process is advantageous.

FRENCH type of degreaser. This apparatus is built by Mabor.



Justh, which appears in *Ober-Flächen Technik*, is worth reproducing here.

"Unsatisfactory results in plating are often due to the degreasing process applied immediately before plating. Passivation of the surface

In most degreasing processes it is advisable that the pieces should not be dried after degreasing, and should be plated as soon as possible. An acid treatment of cold-deformed parts before plating is recommended to obtain an absolutely clean



metallic surface on which the deposit adheres firmly."

Another important article on electrolytic cleaning and its application was written by K. W. Frohlich, an abstract of which appears in the June, 1934, *A. E. S. Review*, or C. A. 28, 1934. An abstract of an article on the "Plating of Castings," by B. Caplan, in *Metal Industry* (London), March, 1934, is also given in the June *A. E. S. Review*, which has interesting information on electrolytic anodic etching of brass and bronze in a 5 per cent cyanide solution. Anodic etching of both ferrous and non-ferrous work is also described in another abstract in the same review of an article on nickel and chromium plating technique by Cook & Evans, from *Metal Industry* (London).

A similar article from the French point of view, covering metal cleaning before electrodeposition, both with solvents and aqueous solutions, appeared in the March and April, 1933, issues of *Galvano*.

A number of photographs and drawings of European metal cleaning equipment are reproduced in conjunction with this article. They serve to give a good idea of the types used. It will be noticed that these are much like our machines, differing only in detail. Comparative pictures of American equipment have not been included. A collection of pictures of all types of American metal cleaning and finishing equipment can be found in the booklet "The Cleaning of Metal" by the writer and published by the Magnus Chemical Co.

## Continental Can Buys Whittall Co.

CONTINENTAL CAN CO., INC., has purchased a majority interest in the common stock of the Whittall Can Co., Ltd., Montreal, Canada, at \$8.50 per share. The same offer will be made to the remaining holders of Whittall Can Co. common shares.

The Canadian firm is one of the leading can manufacturers of Canada, supplying tin containers to important packers of fruits, vegetables and other food products as well as a general line of cans for paints, varnishes, oil, tea, coffee, spices, chemicals and other miscellaneous products, according to the announcement.

## Magnaflux Inspection for Cracks and Seams

(CONTINUED FROM PAGE 41)

receive the shafts which are rested on the pillow blocks at the extreme bearing surfaces. The blocks are high enough to accommodate the throw of the shafts. The most damaging location for these defects to occur is on the bright finished parts of the shaft, and for this reason the wet method of inspection is generally finding more favor because the black powder used gives a marked contrast against the bright surface and very faithfully pictures the character of most defects. Some defects found in bright parts are down in the tenths of thousandths of an inch in depth and are sometimes so small that the line of powder locating them can best be verified by use of a low-powered magnifying glass.

Defects commonly found in shafts which have been in service after a considerable length of time are usually traceable to fatigue and are transverse in character. The Surface Transportation Co. of New York and other bus companies have for some time found it worthwhile to conduct periodic inspections on bus motor crankshafts, steering knuckles and other parts, and their continuance of this procedure would indicate that they continue to consider this inspection of great value. These defects being roughly at right angles to the axis of the shaft, it is customary to employ, in such cases, the longitudinal type of magnetization. Equipment recently developed for this particular type of work is shown in Fig. 4. Fig. 5 shows a defect of this type found in a crankshaft which had been in service.

From the foregoing it can be seen that Magnaflux inspection is furnishing a non-destructive test method which is proving of value in many plants for locating seams which may result in immediate or future damage. Obviously it is desirable to conduct such inspection at as early a point in the manufacturing process as possible to avoid unnecessary work on material which will eventually prove faulty. Inspection on the chipping bed is already under trial and it

is possible that many of these defects will, in the future, be located at this point before the billets have progressed to the stage of becoming hot-rolled bars or forgings.

*Editor's Note: The Magnaflux Corp. will have an exhibit in Booth F-19. There will be conducted actual inspections of tools, heat-treated parts, tool steel, high-speed steel, aircraft engines and automotive parts, springs, etc.*

## Steel Corporation to Merge Detroit Sales

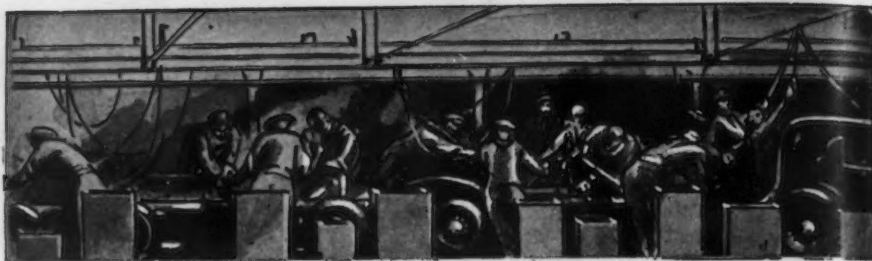
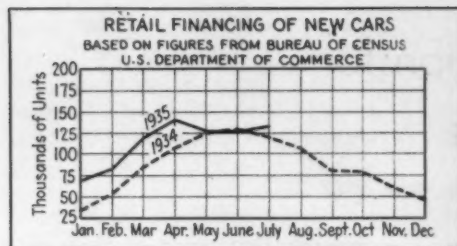
CONSOLIDATION of Detroit sales activities of the Carnegie Steel Co., the Illinois Steel Co., the American Sheet & Tin Plate Co. and the American Steel



P. M. GUBA

& Wire Co. under Philip M. Guba was announced late last week by the United States Steel Corp. Since March 1, Mr. Guba has been Detroit manager of the Carnegie and Illinois companies and he will now have charge of the sales of the other two organizations, even though transactions will continue to be made in the names of the individual companies.

H. A. Maguire, who has been Detroit sales manager for the Steel & Wire company, will be Mr. Guba's first assistant, while Howard V. Clark, since March assistant manager at Detroit for the Carnegie and Illinois companies, will be second assistant. James A. Smith, Jr., will be office manager.



## THIS WEEK ON THE

# Auto Parts Production at High Levels As Car Makers Prepare Schedules

DETROIT, Sept. 24.

THE pitch of excitement to which Detroiters are rapidly being aroused is a sign that the official opening of the 1936 automotive season is only a few weeks distant. Previews of new models and sales meetings of factory field staffs are drawing attention and production executives are ironing out any kinks which later might interfere with manufacture of the new cars.

However lukewarm the industry might have been originally toward the experiment of introducing new lines in the fall, it now is putting everything it has into making the plan work. Many companies already are furiously engaged in building banks of parts to feed assembly lines as soon as the word is given to start production. The volume of parts manufacture is so great as to place some plants on extra shifts.

Management usually counts on the first few weeks of assembly operations to eliminate troubles which almost invariably spring up. Pontiac has done a surprising thing by reaching a daily output of 300 cars in less than a week after it began to build 1936 models.

Oldsmobile is duplicating Pontiac's feat, having started from zero a week ago and hoping within 10 days to get up to 800 units daily. Dodge, just getting started on assemblies this week, is counting on boosting operations quickly and has scheduled 18,000 cars for October.

By early October, practically all companies will be in full swing. Chevrolet assemblies will begin the week of Sept. 30, and by that time Ford will be well under way at Branch assembly plants. Buick is

the first large car maker to shove off on the 1936 sales voyage, Sept. 28 being the date. Packard will follow the next day and Ford, with the same basic features in its V-Eight as during 1935, will introduce its new models early in October. Almost all manufacturers will have presented their new lines before the curtain rings up on the New York Show Nov. 2. Some companies, like Dodge, will give dealers prices and cars to sell several weeks in advance of formal announcements.

### Outlook for 1936 Bright

Any Casper Milquetoast who is timid about shouting praises of 1936 can secure a transfusion of new life by contacting automotive executives. Buick publicly boasts that it intends to build and sell 135,000 cars next year. Pontiac modestly puts its goal at 225,000, with Oldsmobile probably preparing to hit the same mark. Chevrolet privately confesses that it won't be satisfied with less than 1,000,000 cars and hints that it would like to overshoot that figure.

Chrysler also has high hopes. It has its eye on 900,000 as a total within its reach. Henry Ford, who so freely predicted that 1,000,000 V-eights would be built in 1935 and now is within a few thousand of that mark, refuses to go on record regarding 1936, but the Ford organization at Dearborn is suffused with optimism and it is no secret that it will be disappointed if it doesn't move ahead of this year's volume by a comfortable margin.

Hardly ever has a fourth quarter loomed brighter than this year. Production during the next three months will be at least 700,000 cars and trucks, and there is a possibility that the total may equal

the 747,039 units made in the final quarter of 1929. Chevrolet and Ford together should turn out 400,000 units. Oldsmobile officially remarks that it will build 43,000 cars the remainder of the year and Pontiac's performance should closely parallel that of its Lansing rival. Chrysler, with Plymouth and Dodge on heavy schedules, should be good for 200,000 units. With other important companies to be heard from, the total will probably make the statisticians dig in an effort to uncover a better fourth quarter.

The Automobile Manufacturers Association estimates the year's production at 2,960,000 passenger cars and 740,000 trucks, a total of 3,700,000 units, compared with 2,869,963 units in 1934 and 3,510,178 units in 1930. Next year the industry expects to build over 4,000,000 units, preparing itself for that cheerful event by acquiring new plants and rehabilitating others. Chevrolet, for example, believes it will need the full capacity of its Saginaw gray iron foundry the coming year, the result being that Pontiac is spending \$500,000 to renovate its foundry where cylinder blocks, flywheels, clutch housings, exhaust and intake manifolds, oil pumps and cylinder heads will be cast. The foundry will be ready to operate in December. Pontiac will save on transportation of castings, because its foundry adjoins its manufacturing plant at Pontiac, whereas castings made for it by Chevrolet have been hauled from Saginaw.

### Competition To Be Hot

Competition in 1936 is to be no weak tea affair. Buick has reduced prices \$40 to \$385, placing itself squarely in Pontiac's field





# ASSEMBLY LINE

with several of its Special (series 40) models. This reduction, incidentally, has no significance so far as car prices in general are concerned. It is a price readjustment to permit Buick to widen its market. Little change is anticipated in the level of factory retail prices for the industry.

The General Motors management is proceeding on the theory that the corporation as a whole will gain from a cat-and-dog sales fight between divisions. Buick may lose a sale to Pontiac, but will pick up another from De Soto. Buick is making 600 to 700 cars a day and will maintain that rate through October, with a night shift operating on the final assembly line. By announcement date (next Saturday), Buick will have 14,000 new cars in dealers' hands.

Buick will have four lines of cars—the Special, Century, Roadmaster and Limited to correspond to the series 40, 60, 80 and 90 respectively. The big sales push, of course, will be on the 118-in. wheel-base Special, powered by a 93-hp. straight eight valve-in-head motor. Heavier than its predecessor, the Buick 40, it will do 85 m.p.h. The other new Buicks are on wheel-bases of 122 in., 131 in. and 138 in., a total of 14 body types being offered. All sedans have trunks as standard equipment.

Speed is the motif in Buick styling. Radiators are high and wedge-shaped, while fenders are "speed-lined" and attached to a flat running board, after the fashion pioneered by LaSalle. The turret top bodies have sharply slanted split Vee-type windshields. Even doors, ventilator handles, instrument panels, trim and all interior fittings give the impression of speed. The hydraulic brakes have centrifuge drums on the Special and cast iron drums on the other series. The emergency brake operates through a cable to the rear wheels, the brake handle being at the left of the driver.

A spring steel "ride stabilizer," to eliminate roll and sidesway, is

BY BURNHAM FINNEY

Detroit Editor, *The Iron Age*

• • •

mounted across the front end of the frame. Front wheels are independently sprung, while the rear end of the rear springs are 9 in. longer than the front end, giving uniform flexibility throughout the spring travel. Automatic devices are freely provided—for the choke, idle control, heat control and vacuumatic spark. Bore and stroke of the Special engine are 3 3/32 by 3 3/8 in., giving a piston displacement of 233 cu. in. The compression ratio is 5.55 to 1.

## Buick Offers Anolite Pistons

Buick calls its new pistons Anolite pistons instead of aluminum. The anodic treatment, whereby the surface of pistons is hardened and made slightly porous, is claimed to provide the most efficient lubrication yet known for cold starting and breaking in of the engine, since oil is absorbed by the pistons and sticks to their surface. It further is asserted that connecting rods last two and a half times longer under the bearing loads of Anolite pistons than under those of cast iron.

After wavering over whether to have steel tops or stick to fabric tops, Chrysler is understood to have decided on a welded steel insert similar to that used the past year by Hudson for all its lines of cars. The rubber cushioning which will be employed around this insert as an insulating agent will provide a place to ground the antennae for radio-equipped cars. It will be recalled that General Motors cars ground their radios under the running board. Studebaker is said to have a one-piece steel top on its 1936 model's. Hudson also has gone over to a one-piece steel top somewhat similar to General Motors and Nash-LaFayette have abandoned fabric tops in favor of steel. The new Lincoln is reported to have a steel top. This leaves Ford

and Packard as the only important manufacturers which apparently have no intention of going to a steel top the coming year.

## Cord Car To Be Radical

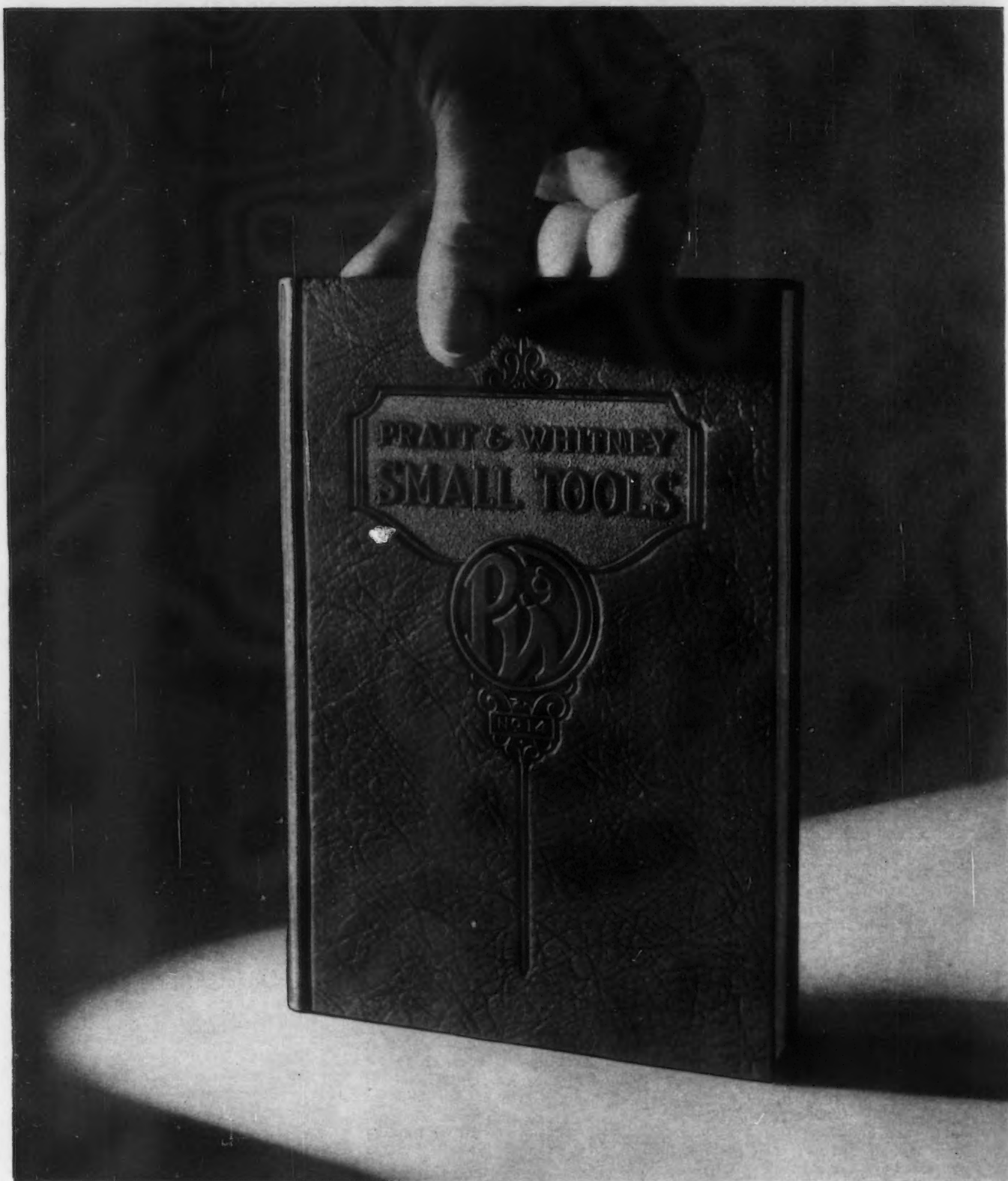
Auburn is planning on making the newspaper headlines with a radically-designed Cord car. The new Cord is said to go Chrysler's Airflow one better in streamlining. Instead of the traditional radiator shell, the hood front slopes forward to join the front fenders. The windshield and rear of the body are sharply slanted. Door handles and hinges are inset. Retractable front headlamps have been designed so that they can be recessed into the fenders and covered by a slide panel during the day, according to reliable advices. The car will be of the front-drive type, pioneered by Cord, and will have a V-eight motor.

Not yet ready, but a strong possibility for 1937, is a tubular frame for automobiles. Chrysler is known to have been working experimentally on this development, one of its chief advantages being lightness of weight without sacrifice in strength.

Passenger car selling is to be a he-man affair the coming year, with rapier thrusts at competitors as much in order as courtesy bows. LaFayette gives an example of what is to be expected. Each dealer's showroom is equipped with what is termed an "X-ray system" whereby prospective customers can see what actually is inside competitive cars, not what the maker claims is inside. LaFayette especially picks out as the butt of its attack wood pillars in bodies usually referred to as all-steel and "steel bodies which give you only wire mesh and fabric over your head." LaFayette flatly declares that it is the only car in its price class which has a complete seamless all-steel body, top, sides and floor.

Interest has been stimulated in the Detroit steel trade by the fact

(CONTINUED ON PAGE 177)



This new book, fresh from the press, will  
be sent free to any executive requesting it  
on his company's letterhead . . . .

**PRATT & WHITNEY CO.**

**Hartford, Conn.**





## NEWS OF THE WEEK

### Republic and Corrigan, McKinney Stockholders Approve Merger— Truscon To Be Added

**S**TOCKHOLDERS of the Republic Steel Corp., meeting at the company's office in Jersey City, N. J., Sept. 23, approved Republic's acquisition of the assets of the Corrigan, McKinney Steel Co. and control of Truscon Steel Co. Changes in Republic's capitalization and the creation of a new issue of general mortgage bonds were also approved by stockholders.

Votes representing substantially more than the required two-thirds of both the preferred and common Republic stock were cast in favor of the plan, it was announced at the conclusion of the meeting by T. M. Girdler, chairman of the Republic company.

In Cleveland, on the same day, stockholders of Corrigan, McKinney voted in favor of the acceptance of the plan.

The acquisition of Corrigan, McKinney will be consummated promptly upon the execution and delivery of the required papers and securities.

Stockholders of Truscon who desire to accept Republic's exchange offer have been asked to deposit their Truscon stock on or before Oct. 10. Important stockholders of Truscon, at the time when Republic's plan was first announced, entered into contract to exchange their Truscon stock for Republic stock on the agreed basis if and when the offer was made.

#### New Stock to Be Created

In voting in favor of the proposed merger plan, Republic stockholders approved:

1. Creation of a new class of prior preference stock; increase of author-

ized amount of common stock; provisions of exchange of present preferred stock for new prior preference and common; creation of a new general mortgage of Republic; and the sale to the public of \$24,000,000 of the new convertible general mortgage bonds.

2. Acquisition of the business, plants and properties of Corrigan, McKinney in consideration for securities of Republic.

3. An offer to present preferred and common stockholders of Truscon to exchange Truscon stock for the new prior preference and common stock of Republic.

Of the new general mortgage bonds of Republic to be issued under the plan, \$24,000,000 were recently offered to the public by Kuhn, Loeb & Co. and Field, Gore & Co., and were promptly subscribed, the bonds now commanding a premium.

#### Capital Structure Simplified

The recapitalization plan simplifies Republic's capital structure, eliminates dividend arrears on outstanding preferred stock exchanged, reduces the amount of preferred outstanding, and enables retirement of present outstanding refunding and general mortgage. It also provides for funded indebtedness maturing this year and furnishes additional working capital for the consolidated properties. This places both the preferred and common stockholders in a more advantageous position with respect to future earnings.

In payment for the plants and properties, business and good will of Corrigan, McKinney, Republic steel is assuming all of the former's liabilities and delivering \$15,-

361,000 20-year purchase money Republic bonds, 27,929 shares of new prior preference Republic stock, and 698,223 shares of Republic common stock.

#### Offer to Truscon

To Truscon stockholders, Republic offers, subject to consummation of acquisition of Corrigan, McKinney, one-half share of prior preference stock and two shares of common stock of Republic for each share of Truscon preferred; and four-tenths of a share of common stock of Republic for each share of Truscon common.

The merger, while not altering Republic's status as the third largest steel company in the United States, will substantially strengthen its standing in this respect. The pro forma consolidated balance sheet of the company, giving effect to the plan as of June 30, 1935, contained in the prospectus issued in connection with the new Republic securities (assuming that all present Republic preferred stock and Truscon stock are exchanged in accordance with the plan), indicates total assets of Republic, after completion of the plan, of \$301,432,465, with total current assets of \$69,013,324 as compared to total current liabilities of \$10,460,371.

The addition of Truscon to the picture lends added assurance of broad marketing outlets for the steel produced by Republic and Corrigan, McKinney plants. Through Truscon outlets, Republic will obtain a ready-made market among final consumers of steel, particularly in the building field, which, in the opinion of many observers, represents one of the great future potential markets for the steel industry.

This ties closely into the efforts which Republic has already made to broaden its outlets for pre-fabricated steel, as evidenced by its promotion of the steel-frame house, examples of which were built this spring at Washington by the Berger Mfg. Co., Republic subsidiary.

# British Iron and Steel Markets Active With Export Demand Heavy

LONDON, Sept. 23.—(By Cable)—Pig iron is steady but current business is limited to small prompt parcels as consumers are covered well ahead. Hematite is active and expansion is expected in view of steel activity.

Semi-finished steel makers are barely keeping pace with requirements. Heavy buying of light sections and rails continues. Structural steel is being well specified and engineering and rolling stock requirements are growing. The motor trade is buying more special steels. Overseas demand is good notably from South Africa.

August exports of pig iron were 11,300 tons, none of which was shipped to the United States. Total exports of iron and steel 202,500 tons.

Tin plate home demand is large in the aggregate and export buying is steady, possibly for war purposes. Inquiry is good.

Continental iron and steel markets are especially quiet because of the unsettled political outlook, lack of English buying and payment difficulties in certain European countries. Bars are neglected while plates and sheets are quite active with fair English buying.

The International Steel Cartel and the International Rail Makers Association are meeting in London Oct. 4.

The Continent has booked an Argentine order for 42,000 tons of rails.

## Cleveland Foundrymen Open Fall Meetings

A THOUGHT-PROVOKING address on the "Merchandizing of Castings," by J. H. Redhead, president, Lake City Malleable Co., Cleveland, featured the first fall meeting of the northeastern Ohio chapter of the American Foundrymen's Association, held at the Cleveland Club, Sept. 19.

Dan Avey, editor, *The Foundry*, and president of the American Foundrymen's Association, brought the greetings of the A. F. A., and Russell Lincoln, assistant sales manager, Osborn Mfg. Co., gave a "coffee talk" on the subject of "Trout Fishing and Deer Shooting." Walter H. Woody, manager, National Malleable & Steel Castings Co., and chairman of the chapter, presided.

It was announced that the next meeting will be held Oct. 17, with John W. Bolton, Lunkenheimer Co., as the principal speaker.

The next several years would offer great merchandizing opportunities in all lines, said Mr. Redhead. But only through salesmen who have thorough knowledge of their products and the requirements of their customers can these

opportunities be capitalized by the foundry industry. Salesmen, he said, should be recruited from the best informed men in one's plant. They should know not only their materials, but general manufacturing requirements and something of marketing methods, including advertising technique. Sincere belief in the economic value of cast parts, especially in view of latter-day technical developments, was said to be necessary in the salesman, and simple dramatizing of the status of modern foundry products should be undertaken by foundries in their selling efforts.

Mr. Redhead said that his company had exhibited with profit at the recent Machine Tool Show in Cleveland by dramatizing in a simple but effective way the technical features and design economies of modern malleable castings for machines of various types. The foundry industry is basically important. It should give publicity to its products and employ salesmen who know and believe in the value of the products of the foundry, he said.

## Overseas Visitors Entertained at Show

A DINNER given by the National Machine Tool Builders' Association to overseas visitors at the Machine Tool Exposition was an outstanding event of the second week of the show. Held at the Union Club of Cleveland, the dinner was attended by the chief executives of leading machine tool companies as well as by prominent visitors from many countries, including England, France, Germany, Italy, Russia and Japan. Fred H. Chapin, president, National Acme Co., presided and Louis Pelletier extended greetings to the foreign guests.

James D. Mooney, vice-president in charge of overseas operations for General Motors Corp. and president of the American Manufacturers Export Association, in an address on the "American Foreign Trade Situation," emphasized that American foreign trade must be reconstructed "to the end that our commodity surpluses will be marketed again abroad and to the further end that we shall take foreign goods and commodities in payment for them." Speaking directly to machine tool builders, he said that "the genius you have shown for designing tools to speed up production, reduce costs and improve quality is the best answer I can find anywhere to the calamity-howlers who would worry us to death about the threat of foreign competition."

### British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export .....	£9	
Billets, open-hearth .....	£5 10s.	to £5 15s.
Tin plate, per base box.....	*18s. 2d.	to 18s. 7½d.*
Steel bars, open-hearth .....	£7 17½s.	
Beams, open-hearth .....	£7 7½s.	
Channels, open-hearth .....	£7 12½s.	
Angles, open-hearth .....	£7 7½s.	
Black sheets, No. 24 gage.....	£9 5s.	
Galvanized sheets, No. 24 gage.....	£11 5s.	

\*To Nov. 1; 18s. 5d. to 18s. 10½d. thereafter.

### Official Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £

Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain franc equivalent and then converting at present rate of dollar-franc exchange.

Billets, Thomas. £2 7s.	
Wire rods, No. 5 B.W.G. ....	£4 10s.
Steel Bars, merchant .....	£3 5s.
Sheet bars.....	£2 8s.
Plate, ¼ in. and up .....	£4 2s. 6d.
Plate, 3/16 in. and 5 mm. ....	£4 4s. 8d.
Sheets, ½ in. ....	£4 9s. 8d.
Beams, Thomas. £3 2s. 6d.	
Angles (Basic) ..	£3 2s. 6d.
Hoops and strip base .....	£4 2s. 6d.
Wire, plain, No. 8 .....	£5 7s. 6d.
Wire nails.....	£5 15s.
Wire, barbed, 4 pt. No. 10 B.W.G. ....	£5 15s.



# Rust-Proofing, Induction Heating and Gear Finishing Discussed by S.A.E.

**M**ETHODS of finishing transmission gears, resistance welding, induction heating, and rust-proofing and paint adherence technique were the subjects discussed at the meeting at the Hotel Statler, Cleveland, of the production section of the Society of Automotive Engineers on Sept. 18. Joseph Geschelin, Detroit technical editor of *Automotive Industries*, presided.

Gear finishing operations start in the steel mill and are carried along in the forge plant, since it is vital to have an accurately finished, true running blank on which to cut the teeth, said S. O. White and Marley C. Hedgeland, Warner Gear Co., Muncie, Ind., in their paper dealing with methods of finishing transmission gears. The authors pointed out that burnishing contributes in no small way to quiet running gears, but it can no longer be regarded as a cure-all or corrective for machining or cutting errors. This is because the irregularities in green gears are crushed down or rolled over and the surface compressed. Heat treatment relieves the strains and the irregularities come back to a certain extent.

Slides were shown of various kinds of gear finishing machines developed by the Cimtool Co., Fellows Gear Shaper Co., Michigan Tool Co., National Broach & Machine Co. and National Tool Co. The authors commented that "neither the prevention of fire distortion nor its satisfactory correction have yet been achieved." They further remarked that "there is plenty of work ahead for the steel maker, the forger and the machine tool and cutter maker, with constant vigilance and painstaking care on the part of the gear maker, to get the most out of the tools that are at hand."

Induction heat is a practical and versatile tool and should be given consideration for many more jobs in automobile production, declared E. L. Bailey, electrical engineer, Chrysler Corp., Detroit, in a paper on induction heating. He said that this method is being used daily by brass companies to melt tons of non-ferrous alloys, by steel companies to produce large quantities of high-melting-point alloy steels, by a large bicycle concern to bake colored enamel on bicycle frames and forks, and in heat treatment of steel, from safety razor blades to crankshafts.

"Production efficiency of the induction oven is high, as all the

electric energy of the high frequency circuit is used inside the oven," asserted Mr. Bailey. The part being baked is always the hottest spot in the oven. The air circulated and discharged to carry away the fumes of baking is low in amount and 40 to 50 deg. lower in temperature than the parts, as is the oven temperature itself. Radiation thus is much less through oven walls than in conventionally air-heated ovens. When no load is going through the coils, no power is being used except that due to the loss in the coils and walls, which is made to balance the radiation.

Standard oven practice determines the general form of an induction oven, with addition of a special structure for the coils, substituting aluminum rails for the conveyor through the inductor coils and using good thermal walls. The induction coils are wound close to the walls, floor and roof to form a simple solenoid through which the painted parts are carried on a single chain conveyor. The heat effect is planned so that the temperature of the parts is quickly raised to the required value; for example, for a 60-min. bake, five to six min. is required to bring the parts up to temperature. The balance of the oven is designed to hold the temperature in the oven constant. This is accomplished by a relatively large number of turns for the coils at the head end of the oven with the wires much further apart, giving a lower flux density in the remaining part of the oven.

## Rust-Proofing Inexpensively

F. P. Spruance, American Chemical Paint Co., Ambler, Pa., in his paper on rust-proofing, asserted that the search for an inexpensive coating for steel which would not break when the metal is bent or distorted led to the development of Cromodin, a chromate coating easily applied and which becomes an integral part of the steel itself. Mr. Spruance said that "for steel that will be subjected to rough treatment, this process has proved superior in effect to the phosphate coatings." It is as ductile and as elastic as the steel base.

The low cost of Cromodizing, declared Mr. Spruance, plus the simplicity and speed with which it can be applied, opens the field to treatment of steel products which previously have not had protection against corrosion. The process, designed to treat cold-rolled steel to prevent rusting under paint, is surprisingly effective in accomplish-

ing the same results on hot-rolled or forged steel and on castings. Mr. Spruance discussed various rust-proofing processes, such as bonderizing, spra-bonderizing, electro-granodizing and zinc granodizing. He commented on the excellent results secured in cleaning steel with the deoxidine type of cleaner which is more necessary today than ever. Without it, rust from the extensive soldering required in present automobile body construction would soon ruin the finish.

In the discussion of the papers by Mr. Bailey and Mr. Spruance, W. B. Hurley, Detroit Edison Co., Detroit, described a process being used at the Budd Wheel Co. in Detroit in rust-proofing wheels preparatory to the painting operation. In this process a motor generator set furnishes current at approximately 960 cycles of frequency as compared to the normal 60-cycle current. Parts to be rust-proofed are cleaned in the ordinary manner and immediately after the rinse pass through an induction coil where they are given a heavy charge of induction heat. This quickly dries off any remaining moisture and thus stops the formation of rust.

While still hot, parts pass into the rust-proofing tank which contains activated phosphates. They enter the field of another induction coil and become heated, facilitating deposition of a fine-grained coat of phosphate. Leaving the tank, parts go through another induction coil where they are quickly dried. If desirable, they then could be painted and enter an induction oven for final drying.

Mr. Hurley declared that such a combination of cleaning, rust-proofing, painting and drying could be worked out nicely on a continuous conveyor and would lend itself admirably to heavy production jobs. From tests so far run, this method of rust-proofing as compared with the similar method without application of induction heat appears to produce a more highly resistant rust-proof film and to produce the film more quickly and with a saving in the amount of chemicals employed.

The cost of electricity is a small item. Where reasonable electric rates prevail, induction heat could be used to keep the rust-proofing tank at the proper temperature. Where electric rates are higher, the tank could be heated with steam and electric induction used only to heat the parts to be rust-proofed. The fineness of the grain of the phosphate coating produced by induction heating apparently makes the phosphate film denser and more resistant to the penetration of moisture.

# Large Volume of Orders Placed At Machine Tool Show

## *Lively Interest in New Designs*

**W**ITH the ringing down of the curtain last Saturday, it became abundantly apparent that the Third Machine Tool Show, held at the Public Auditorium, Cleveland, Sept. 11-21, had been an outstanding success.

In the 10 days of the show, about 50,000 executives, engineers and others in all branches of the metal-working field and from several foreign countries inspected the modern shop equipment displayed by the 238 exhibitors. This is a count of registrations only; as many visitors stayed more than one day, the daily attendance far exceeded the average indicated by the registration figures.

A large number of orders—estimated as covering more than \$5,000,000 worth of equipment—was placed, and inquiries were such as to indicate that 1936 might possibly be a banner year for the machine tool industry.

The show was not only larger and more comprehensive than the 1927 and 1929 shows under the same auspices but it contained much more new or greatly improved shop equipment. It is also said to have been the largest single-industry exposition ever held anywhere. Its 238 booths ranged in size from 200 to 4000 sq. ft. The 120 members of the National Machine Tool Builders Association had some 900 machines under power, for the most part on actual production operations. The machines covered a wide range of manufacturing and toolroom requirements and were of all sizes, from small bench lathes to an 8-in. bar, openside milling, drilling, boring and thread cutting machine weighing more than 64 tons.

Attractive displays of small tools, including demonstrations by makers of cemented carbides, and of gages and measuring instruments of all types were also in-

triguing to the visitors. Operating exhibits of forging, shearing, bending and press equipment were also a center of interest. Displays of portable pneumatic and electric tools, and of transmission, hydraulic and materials-handling equipment were numerous, and there were informative displays of electric motors and controls, bearings and other machine parts, welding apparatus, and of materials and supplies, including oils and greases for all requirements.

Technical experts, as well as demonstrators, were on hand at all times for consultation, and a wealth of printed data on all new developments were available.

A historical exhibit of some of the machine tools of the past, from early times up to the beginning of the present century, was not only interesting and decorative, but served to illuminate the high development of the shop equipment available today. This exhibit comprised 12 or more actual machines loaned by the Ford Motor Co. and others, and a number of very large pictures furnished by the Museum of Science and Industry.

As stated in *THE IRON AGE*'s report of the first week of the show, the smooth working of the exposition was notable. This was the result of the careful planning of the association's exposition committee, general manager and secretary, and of the staff of Roberts Everett Associates, Inc., the exposition managers. Aisle space and space between machines, so necessary to working demonstrations, were generous. Booths could be easily found. As all machines were finished in the standard machine tool gray, the appearance of the entire exhibit was pleasantly harmonious. Furthermore, the compactness and so-called "streamlining" of most of the equipment contributed a noticeably new and pleasing note.

For visitors and exhibitors, a number of technical sessions and dinner meetings sponsored by the Machine Tool Congress and directed by four engineering societies and the National Machine Tool Builders' Association provided a neutral forum for discussing the design and utilization of modern shop equipment. An outline of the proceedings of these meetings, which were held in the evenings, has or will appear in these columns. They included a formal dinner in honor of the many overseas visitors to the Machine Tool Show and Congress.

### **Marked Improvement in All Classes of Equipment**

Because of the magnitude of the exposition, only a fragmentary report of the new machines and other equipment and the design trends behind them is possible at this time. It may be said, however, that the experimental and design work of the depression years has resulted in marked improvement in all classes of equipment—so much so, perhaps, that the specter of technical obsolescence looms larger than ever. A few random notes on trends are given in the following paragraphs.

First to be noticed about the new machines exhibited was their trimness and compactness, with obvious improvement in appearance and savings in floor space. Most of the new designs look "modern," to eyes accustomed to the streamlined automobile of today.

Next to attract one's attention, perhaps, were the rapidity and accuracy of production, the greater convenience of operation, the accessibility of tooling, and, finally, the features of design and construction.

For the most part the machines were heavier and more rigid, with higher speeds and greater power.



## IMPRESSIONS OF THE SHOW

TO me one of the most impressive features of this show was the tremendous interest shown by and the great number of highest executives—the men who hold the purse strings, financial as well as production executives—of American industry who have visited the show and the number of them who saw immediately that they could not personally cover the show as they should and who, therefore, wired back for production men to come.

The significance of this exposition is that it has given more confidence to American industry than anything which has happened in years; first, because a group of men whose industry has been hit so hard by the depression has had the courage to put on a show of this character and size. This has inspired men of the largest corporations.

It is significant also that Englishmen, Germans, and other foreign visitors were very much interested in this exposition, which they have complimented most highly.

BY H. H. LIND, general manager, National Machine Tool Builders Association, as told to F. L. Prentiss, Cleveland editor, *The Iron Age*.

We have come through a period of five years of terrific uncertainties and wrecked confidence. Irrespective of that, American business is going forward. This forward movement shows the convalescing, healing power and innate strength of American industry. The greatest thing about the show, perhaps, is the confidence it has given to other industries.

The press department is estimating the amount of business done at the show as \$5,000,000.

Thomas J. Watson, president of International Business Machines, instructed his men to discard every machine that was not at least 85 per cent as efficient as the ones exhibited at Cleveland.

I have been watching the types of

orders for some time. For a long time they consisted mainly of orders for machines for the manufacture of automobiles, washing machines, etc. About last March there began a radiation of these and business is now scattered everywhere but among the railroads.

The tremendous development coming out in this show, apparently all at once, hooks in with the tremendous fluctuations of our industry. When business is good there is no time for such work. Our key men are products not only of apprentice training but long experience. When business is good they don't have time to effect such improvements. When times are bad these men cannot be laid off because they are so important, so they work on the developments for which they have no time during busy periods. This is another story of American courage and progress.

A very interesting story for some time would be the marvelous illustration of cooperative effort forward in a competitive industry, an effort to go forward as a unit.

Nickel alloy irons are commonly used for beds and other cast members, and alloy steels, carefully heat treated, for shafts, gears and other parts. Shafts are larger and in many cases gears are ground. Tool steel inserted ways, nitrided ways and even chromium plated ways were to be seen in some machines and nitralloy spindles on others. Use of antifriction bearings has increased, a new 16-speed lathe, for example, having 60 such bearings in the head alone. Multiple-vee belt drives and disk clutches are used more extensively than heretofore. Automatic lubrication systems, including filters and sight feed and safety devices, for bearings, ways and gears are commonly employed. Generous coolant supply and large chip space were other trends to be observed. Means, other than adequate lubrication, are being increasingly incorporated to maintain over long periods the initial high accuracy built into machine tools.

Noteworthy also is the improved facility of control—whether mechanical, electrical or hydraulic. The result is not only a marked lessening of fatigue on the part of the operator, but an increase in production. Many of the larger machines at the show had highly

developed systems of finger tip or push button control. It should also be said that the various control devices like the flange mounted motors employed, are now for the most part integral with the machine. Power-actuated chucks, which also lessen operating fatigue, were also in evidence.

### Hydraulics More Extensively Used

Self-contained power units for drilling, boring, tapping and other operations were exhibited by 10 or more companies. These units permit building up of special machines and in case of changes in product design they can be rearranged or added to to make a machine for the same or different operations on another part.

More extensive use of hydraulic mechanisms was to be observed. In a new lathe speed changes are accomplished by means of hydraulically-actuated clutches, and hydraulic control is employed on a new radial drill for traverse of the head and arm. A thread-cutting machine with a hydraulically-operated mechanism to provide automatic magazine feed and automatic carriage feed and return was exhibited. In an automatic profiling and die-sinking machine, an entirely new unit, the heavy slides are

moved hydraulically to provide smooth progression of the cutter with respect to the work. A bed-type milling machine with hydraulic feed was shown for the first time by another company.

Cemented carbide tools were in greater evidence than at the 1929 show. They were demonstrated by suppliers and were to be seen also in operation on a large number of lathes and other machines throughout the exposition. Improved cemented carbides have been developed within the past few years and diamond impregnated wheels and hand laps made available for finishing them. A number of machines for grinding and lapping these tools was on display.

A number of new and interesting developments not publicized before the opening of the Show included a two-way cutting planer; a centerless lapping machine; an automatic hydraulically-operated profile and die-sinking machine; a "turn milling" machine; a "Roto-Broach" broaching tool; an hourglass gear shaper; a worm lapping machine; a new engine lathe, and new screw machines. These and other new equipment not previously illustrated and described will be included in a forthcoming issue of *THE IRON AGE*.

# Carnegie and Illinois Steel Consolidation Aims Outlined by Myron C. Taylor

CONSOLIDATION of the Illinois Steel Co. and the Carnegie Steel Co. into the Carnegie-Illinois Steel Corp., with B. F. Fairless as president was formally announced Sept. 18 and 19 at luncheons in Pittsburgh and Chicago. Present were officials of the corporation, and its subsidiaries, leaders in the steel industry at each city and consumers of steel mill products.

Myron C. Taylor, chairman of the corporation, and William A. Irvin, president, paid high tribute to past and present leaders of the corporation and subsidiary companies, as well as the vast throng of loyal workers throughout the entire organization. At Chicago, special credit was given to G. G. Thorp, president, Illinois Steel Co., who though desiring to retire a year ago carried on while the new plans of organization were being perfected. Mr. Irvin also announced that G. C. Kimball, who has served as vice-president under Mr. Thorp, will be head of the company in Chicago with a complete staff to handle all matters concerning the corporation's activities in this district.

## Mr. Taylor Optimistic

"There may be those," said Mr. Taylor in his address given in both cities, "who have thought this great nation of ours has suddenly reached the limit of its expansion; that our natural resources have been fully exploited or at least developed beyond the capacity to consume and support. I don't believe it; neither can such a hopeless attitude of mind find a dwelling place in a great and prosperous city. A country so generously endowed by nature, with an ideal range of climate, vast forests, deposits of minerals, arable land, and all that goes to make a nation self-contained inhabited by a progressive and virile people, cannot fail of ultimate recovery, and the re-attainment and passing of the heights heretofore reached in activity and accomplishment, and the greatest opportunity for individual well-being.

"The management of the corporation is continually conscious of the stewardship vested in it by the 240,000 owners of its stocks, and it has only one great objective—to do its work properly and well, to serve the interests which it represents and to so preserve the physical facilities, organization and personnel which have been en-

trusted to its care, that it can pass it on into the future and to other generations as a successful example of demonstrated effort, ability, resourcefulness and forward-looking wisdom.

"The Illinois and the Carnegie steel companies represent over 20,000,000 tons of steel ingot capacity—79 per cent of the corporation's total ingot facilities and 29.2 per cent of the total ingot capacity of the country, of which the corporation's total percentage as of Jan. 1, 1935, was 39 per cent. Thus it will be seen that the Chicago and Pittsburgh districts retain a dominant position as steel producing centers, notwithstanding productive expansion elsewhere.

## Scope of Operations

"A further statistical picture of the extent of the corporation's interests in the Chicago and Pittsburgh districts in their combined scope reveals that 60,353 employees are engaged in the operation of these interests (1930 being taken as

## PROGRAM TO RESULT IN TAX ECONOMIES

THE United States Steel Corp.'s program of consolidating subsidiaries inaugurated with the merging of the Illinois and Carnegie steel companies into the Carnegie-Illinois Steel Corp. It is believed to be designed not only to effect greater operating economies but also to protect the Steel Corporation from at least part of the heavy taxation inherent in the Administration's anti-holding company policies.

Laws now affecting holding companies include one taxing inter-company dividends and another prohibiting holding companies from deducting, in their consolidated tax returns, losses of one operating subsidiary from the profits of another.

Under its present organization, the United States Steel Corp. is a holding company controlling, by stock ownership, numerous subsidiary companies. This structure contrasts with that of another large industrial organization, General Motors Corp., which is essentially an operating company, owning directly the plants and assets of its principal manufacturing divisions.

a fair average), and that total annual payroll exceeded \$110,000,000. The lives of 51,293 employees in these districts are covered by group insurance for an aggregate amount of \$82,717,500. In 1934, pensions paid to employees in these districts amounted to \$2,245,000. Freight payments for the movement of materials in and out of these districts, for a year comparable to 1930, approximate \$73,000,000.

"New conditions having to do with the weight of steel products, quality of materials, accessibility of plants to markets, and modernized merchandising methods, in general, as well as remarkable advancement in the art of steel manufacture, attributable both to new inventions and new practices, have rendered necessary the expenditure of large sums of money in order to meet the demand which new uses for steel and development of new fields of consumption dictate. Fully aware of the need to conserve the liquid resources of the corporation and the many uncertainties which still surround us in the industrial world, we have exercised all caution; and yet we cannot, in justice to our stockholders whose properties we administer, postpone too long those expenditures which are necessary for plant changes and betterments which the conditions indicated demand. At the present time the corporation is spending about \$70,000,000 for plant improvements and developments, and will probably be called upon to spend double that amount in the near future. These expenditures are based entirely upon clearly demonstrated needs, resulting from analyses covering a period of years, and are vital to the maintenance of the corporation's position and prestige in the competitive field of steel.

## Markets Studied

"Since 1928 our efforts have been largely concentrated in determining the answers to questions of vital importance to the Corporation, such as:

1. What is the scope of Corporation work in relation to the steel industry, as regards capacity and production of the various products?
2. To what extent can we meet those obligations as to equipment available and the cost of production?
3. Where are our markets for the various kinds of steel products?
4. Are we prepared to service our customers in those markets in a more economical and better manner?

"Coincident with the analysis of plant manufacturing facilities and equipment, we instituted a budget system, which was carried forward for three-year periods, detailing present and prospective needs, and the cost of developments which might seem advisable. This is a





## Leading Figures in Carnegie-Illinois Steel Merger

LEADING executives of the United States Steel Corp. are shown as they gathered at the William Penn Hotel, Pittsburgh, on Sept. 18, for a luncheon meeting of 275 industrialists and executives in the Pittsburgh area for the purpose of outlining plans for the newly formed Carnegie-Illinois Steel Corp. and to introduce Benjamin F. Fairless, president-elect of the new company. Left to right: Myron C. Taylor, chairman, United States Steel Corp.; Nathan Miller, general counsel and member of the finance committee; William A. Irvin, president; Junius S. Morgan, a director; Benjamin F. Fairless, president-elect, Carnegie-Illinois Steel Corp.; I. Lamont Hughes, president, Carnegie Steel Co., one of the two merged companies.

continuing budget system, and insures keeping abreast of the time of each successive budget project the potential needs one year further into the future. Thus the requirements of the subsidiary companies are certain to receive constant and careful consideration, and we believe that the participation of these companies in our plans for future development will fully meet the expectations of their communities.

"Steel production must necessarily be at points closest to the distributive zone for the same, due consideration being given to comparative cost of production. Competitive conditions demand this. Each division of the unified Carnegie and Illinois organizations will continue to serve its natural consuming territory as heretofore, and its operations and plants will be developed and expanded as that natural consuming territory requires. Naturally, as in any unifi-

cation of interests, there will be a single executive head to the organization. This official will have headquarters at both Chicago and Pittsburgh. Obviously, the magnitude of our operations in both districts bespeaks the need for an extensive high-grade personnel to properly supervise and direct our activities in this district, whose functions may be most properly fulfilled by their location in the area where they are most directly concerned. Coordination and simplification in every way is assured by this unification of direction and control.

### Consuming Market Large

"We may confidently look forward to that day when the present economic readjustments shall have been completed and the normal pace of business activity is restored, for we have within our borders the greatest consuming market in the world. When that

revival materializes, we may reasonably expect the steel industry to fully participate. In our modern civilization, steel plays an indispensable part, and there is an irreducible minimum necessity for steel at all times, which is by no means inconsiderable, to replace that which wears out or is ravaged by nature. Obsolescence implies tearing down and rebuilding. This is true in the humblest homes as well as in the great industries—railroads, automobile, construction, and the like. It is not conceivable that within the past five years the buying of steel has been of sufficient volume to compensate for that which in the ordinary course of events should have been replaced. In due time, all such needs must manifest themselves."

## Corporation Subsidiaries To Be Merged

THE plan of the United States Steel Corp. to simplify its corporate structure, as announced in connection with the merging of the Carnegie Steel Co. and Illinois Steel Co. on Oct. 1, will lead to the merging of many of the company's subsidiaries with the parent organization. Legal notices, suggesting consolidation of the American Sheet & Tin Plate Co. with the Sharon Tin Plate Co., a subsidiary, have been published. Other proposed consolidations are the Carnegie Steel Co. with the Clairton Steel Co. and Clairton By-Products Co., both of Clairton, Pa.; the Lorain Steel Co., Johnstown, Pa., and the Union Steel Co., Pittsburgh.

## Irvin to Address Metals Banquet

William A. Irvin, president, United States Steel Corp., New York, will address the members of the American Society for Metals, at their annual banquet to be held Oct. 3, at the Palmer House, Chicago.

Mr. Irvin is rounding out his fortieth year in the steel industry, and has much in common with the members of the A. S. M.

The annual meeting of the Metal Treating Institute will be held at the Palmer House, Chicago, Oct. 2, at 9:30 a. m. This general meeting will be preceded by a meeting of the board of trustees at noon, Oct. 1, also at the Palmer House.

## Steel Constructors Name Iden Secretary

V. Gilmore Iden has been elected secretary of the American Institute of Steel Construction. Mr. Iden has been serving the institute as acting secretary for the past year.

He joined the staff of the American Institute of Steel Construction in 1927 to become its director of public relations. Prior to that time he had been engaged in newspaper work in Washington and New York.



V. GILMORE IDEN

Mr. Iden is spending this week in Toronto, where, on Sept. 24, he addressed a luncheon conference of the Canadian Institute of Steel Construction, his subject having been "Steel, the Civilizer." In this talk, he outlined the progress made by the American Institute of Steel Construction in the last 15 years.

On Sept. 25, Mr. Iden is scheduled to speak on "Cooperation vs. Coercion," at the annual convention of the American Trade Association Executives.

## Boiler Institute Names Officers

AT the annual meeting of the Steel Heating Boiler Institute held in Buffalo, Sept. 18, the following officers were elected: President, J. T. Dillon, Jr.; vice-presidents, Homer Addams and W. R. Meikle, and secretary and treasurer, R. A. Locke.

Directors are: Homer Addams, president, Fitzgibbons Boiler Co.; J. R. Collette, vice-president, Pacific Steel Boiler Co.; Charles Crouse, vice-president, National Radiator Corp.; R. B. Dickson,

president, Kewanee Boiler Corp.; J. T. Dillon, Jr., president, Struthers-Wells-Titusville Corp.; F. B. Metcalf, president, International Boiler Works; H. H. Peek, president, Lookout Boiler & Mfg. Co.; John Trefts, president, Farrar & Trefts and C. N. Tull, president, Spencer Heater Co.

## Inland Acquisition Of Ryerson Approved

AT the special stockholders' meeting of Inland Steel Co. Sept. 20, the plan of reorganization to effectuate the union of the business of Inland company with that of Joseph T. Ryerson & Son, Inc., was approved.

The charter was amended by increasing the authorized no par value shares from 1,200,000 to 1,600,000, of which 240,000 shares were authorized to be issued for the acquisition of all of the assets, business and good will of the Ryerson company.

Edward L. Ryerson, Jr., Joseph T. Ryerson and Everett D. Graff were added to the board of directors of Inland company. J. H. Morris was also elected a director.

Edward L. Ryerson, Jr., is president and a director of the Ryerson company. He entered its employ in 1909 and, after service in all departments of the company's business, he became vice-president in charge of operations, and in 1929 was elected president.

Joseph T. Ryerson is a director of the Ryerson company and was its president until 1929. Starting his business career with the American Sheet Steel Co., at Vandergrift, Pa., where he gained considerable steel mill experience, he became associated with the Ryerson company in 1902. For a number of years he was manager of the company's New York plant, becoming vice-president and treasurer of the company in 1916, and serving as president and treasurer from 1923 to 1929.

Everett D. Graff is first vice-president and a director of the Ryerson company. He began in the company's mailing room in 1906 and served in many departments. He was Pittsburgh representative from 1909 to 1914, returning to Chicago thereafter to become director of purchases. In 1919 he became assistant to the vice-president, in 1928 vice-president, and in 1929 a director. He was elected first vice-president in 1932 and since that time has taken active leadership in all branches of the business.

## Pontiac Will Reopen Foundry

THE Pontiac Motor Co. is spending \$500,000 to renovate its gray iron foundry at Pontiac, Mich., and bring its equipment up to date. Closed since the spring of 1932, the foundry is expected to reopen in December. A progressive charging plant is being installed to serve the cupolas. The conveyor system is being modernized to conform to changes in plant layout, a sand blast and apron conveyor being added to provide progressive cleaning of castings. Chipping and sandblasting are to replace milling in the cleaning of cylinders so that if any slag remains on the surface, it will be dug out. Waste sand will be reclaimed and used over in the foundry and in part of the core work. The Pontiac foundry was built in 1928 and has four cupolas with an output of 400 tons of castings a day.

## Automobiles Influence Bar Consuming Center

AUTOMOBILES require such a large proportion of the total production of cold-finished and alloy steel bars that the geographical center of consumption of both products is within 50 miles of Detroit, the center of the automobile industry, according to the American Iron and Steel Institute.

Consumption of cold-finished bars is centered around Toledo, Ohio, and the center of consumption of alloy bars is located somewhat west of Toledo in the same county.

Center of production of cold-finished bars is near Akron, Ohio, in Summit County, while the center of production of alloy steel bars is in Lucas County, Ohio, which happens to be also the geographical center of consumption for that product.

Public reception of beer in tin cans has been found so satisfactory by the Pabst Brewing Co., Milwaukee, that a third canning unit is being installed in the brewery with the cooperation of the American Can Co. It is stated that contracts so far entered into with brewing companies are on a basis of the probable requirements, and as the limits of the canned beer market have not yet been at all tested, it is impossible to foresee how rapidly production facilities will have to be increased.





R. L. HARDING

## Foresees Pre-fabricated House as Development Of Near Future

WASHINGTON, Sept. 24.—A permanently built, modernly equipped, pre-fabricated home within the reach of every thrifty American family was envisaged as a development in the not distant future by Ralph L. Harding, chief of the Division of Metals and Minerals, Department of Commerce, in a radio broadcast last week. He spoke under the auspices of the George Washington University forum.

Mr. Harding said that this wide market exists and that, except for a cost that is low enough, every essential factor, such as intelligent experimentation and research work, is at hand for successfully filling the demand. The proper cost, he declared, "is almost, if not quite, in sight." He pointed out, however, that the real pre-fabricated house development, the one that may assume large proportions and exert great influences upon the nation's economy and living standards is not here yet, though well along in its experimental and formative stage. Emphasizing the matter of cost, Mr. Harding explained that in almost all other fields, except house construction, huge strides have been made in the ability to produce cheaply and well.

"Certainly we should have no quarrel with methods and materials simply because they have been in constant use for centuries—rather the opposite as long as they efficiently fill the need for which they are designed," said Mr. Harding. "But many have come to feel that our traditional methods and materials for house construction are not doing this today, for, with the costs which they entail, it is almost impossible, particularly in our cities, to produce an adequate, modernly equipped home within the price range that the average family can afford."

To give a picture of the potential market for pre-fabricated homes, Mr. Harding directed atten-

tion to what he said is a known accumulation of perhaps 1,500,000 needed residences now and an added yearly need of 500,000 more, a source that offered a large field of opportunity toward recovery. The objective he pointed to was a small, permanently built, modernly equipped dwelling to house reasonably a family of four and to cost from \$1,800 to \$2,000, definitely planned for possible expansion.

"When we succeed in producing such a unit it seems assured that the market for it will be fully broad enough to justify the mass production methods that in turn will be essential to keep the cost low enough," he declared.

Mr. Harding said that some of the organizations working on the problem of the pre-fabricated house have attacked the work in a truly scientific way by modern research methods and that it is to them that hopes are to be pinned.

"Their first logical step was a determination of the probable market for a mass production product," Mr. Harding explained. "Government statistics provided a basis for this study. The 1930 census indicated that we have a population of about 125,000,000, divided into perhaps 31,000,000 families, averaging slightly over four people each. Various rather comprehensive housing studies show that about one-third of our families pay less than \$15 per month in rent or rent equivalent, 75 per cent pay less than \$30, 93 per cent pay less than \$50 and only a scant 1 per cent pay over \$75 a month. Roughly, a \$15 monthly rental indicates a \$1,500 value; a \$50 rental a \$3,000 value, etc., including land. Roughly again, the income and ownership statistics seem to indicate that a family is justified in owning a home the value of which is about twice the family's yearly income. To reach effectively the group paying below \$15 per month seems, even to the most optimistic, quite out of the ques-

tion. It remains distinctly a matter for social subsidy in some sort of cheap multiple housing. About 7 per cent of our population are paying over \$50 and on that outlay can secure suitable existing property to advantage. Obviously no bulk market lies in this group.

"But 60 per cent of our population, or nearly 20,000,000 families of us, are now paying the equivalent of from \$15 to \$50 a month for living quarters. What an accomplishment it would be if the healthfulness, comfort, convenience and self-respect that this outlay would afford could be doubled or tripled! If we deduct 10 per cent from the total property valuation as the allowance for the land, some 42 per cent of us could rightly afford a house costing from \$1,350 to \$2,700, and 18 per cent a house ranging from \$2,700 to \$4,500."

### Conveniences Not Within Reach

It was pointed out that so little progress has been made in the production of low-cost, modernly equipped units that not more than half of the families can afford a reasonable degree of modern conveniences and sanitation in their homes, Mr. Harding said that certainly the brains and ingenuity that have devised such marvelous progress in machines, the use of power and the technique of production in other lines should—and will if properly directed—be able to devise means of giving the average American family a livable home, modernly equipped and within its modest means.

"To attain this end," he said, "study is pointing toward more effective standardization and, in some cases, toward larger, more thoroughly pre-fabricated units—whole walls, with doors, windows, insulation and trim put in place at the factory, interior partitions with lighting and plumbing fixtures built into them, floors and roofs made in a few large pieces, etc. The ideal materials and technique have certainly not all been discovered and perfected yet, but research is converging upon them. Old familiar materials are constantly being improved, their utility broadened and their cost decreased. Undoubtedly the final solution will include many of these."

Mr. Harding said it is quite possible that the first successful development will not exceed three rooms—a combined living and dining room, a bedroom with bath, and a combined kitchen and utility room, all fully equipped and so arranged as to accommodate additional living and bedrooms when the need for them and the ability to pay for them develop.

# PERSONALS

CYRUS H. McCORMICK, chairman of the board of directors of the International Harvester Co., Chicago, has resigned and is succeeded by his brother, HAROLD F. McCORMICK. Active connection of Cyrus H. McCormick in the farm implement business dates back to 1879 when he started work with his father in the operation and management of the McCormick Harvesting Machine Co. He was elected president of the McCormick company in 1884 and on the formation of the International Harvester Co. in 1902 he was elected president. He resigned in 1918 and was elected chairman of the board, being succeeded as president by Harold F. McCormick. Cyrus H. McCormick was born in Washington, D. C., 1859. He entered the Chicago public schools and was graduated from Princeton University.

Harold F. McCormick was born in Chicago in 1872 and he also received his college education at Princeton. He was made a vice-president of the company in 1902.

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B. D. SAKLATWALLA, vice-president and director of the Vanadium Corp. of America, has resigned to devote his main efforts to the formation of a consulting engineering organization devoted to research and development, especially in connection with new steels and alloys. The contemplated firm will be international in scope, as by suitable connections in foreign countries advancement in these lines in industrial countries will be correlated. Doctor Saklatwalla has had a successful career over a period of 26 years in the ferroalloy and

alloy steel industries and has to his credit inventions of various products and processes. He has written numerous papers on metallurgical subjects and has been honored by the (British) Iron and Steel Institute and with the award of the Grasselli Medal by the Society of Chemical Industry.

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F. P. SCHUSLER, for the past seven years a member of the sales department of the Keystone Steel & Wire Co., Peoria, Ill., has been promoted to the managership of the industrial sales division of the company.

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PAUL WEEKS, for the past four years manager of the Washington office of the Caterpillar Tractor Co., has been made manager of the special sales division, succeeding WALTER H. GARDNER, new general sales manager of Keystone Steel & Wire Co. C. L. McMULLEN will be assistant to Mr. Weeks and will be in charge of engine sales to manufacturers, and G. E. SPAIN will be in charge of power unit sales to distributors and engine dealers. Mr. Weeks, who is a graduate of the University of Nebraska and Massachusetts Institute of Technology, joined the Caterpillar organization in 1910 as consulting engineer. Since then he has served successively as chief engineer, general service manager and Washington manager.

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EDGAR GARLICH will have charge of the new Cleveland sales office of Great Lakes Steel Corp., Detroit, which has been opened in the News

Leader Building. He was formerly associated at Cleveland with the Sharon Steel Hoop Co.

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E. D. PUMPHREY has become a sales representative in Michigan territory for Great Lakes Steel Corp., Detroit. He was formerly Detroit sales representative for the Corrigan, McKinney Steel Co. and previously had been with the Donner Steel Co. at Detroit.

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ROBERT R. SNOW has been named superintendent of the foundry of the Pontiac Motor Co., Pontiac, Mich., which is shortly to be reopened. Mr. Snow has had 35 years of experience in all branches of the foundry business and is one of the pioneers in automotive foundry work.

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WILLIAM R. VEAZEY, head of the department of chemical engineering, Case School of Applied Science, Cleveland, will sever his connection with that institution at the end of the present school year next June to become a member of the executive staff of the Dow Chemical Co., Midland, Mich. Professor Veazey, who has been a member of the Case faculty since 1907, has for the past eight years been a director of the Dow company and its consultant on research and other activities.

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D. L. CABLE has been appointed sales manager of the Ferro Enamel Corp., Cleveland. J. E. HONSEN has been named as director of service and L. B. HART as director of field service.

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E. J. P. FISHER, metallurgist for the Keystone Steel & Wire Co., Peoria, Ill., has resigned to accept a similar position with the Republic Steel Corp.

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DON S. WALKER has been appointed district manager in the Philadelphia office of Combustion Engineering Co., Inc., New York, and will cover the Philadelphia and Washington territories.

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LOUIS SCHWAB, formerly with the Girard Smelting & Refining Co., Philadelphia, has become associated with the Ladenson Metals Corp., Philadelphia.

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A. E. HEROUX has been made general manager of the Permite



CYRUS H. McCORMICK HAROLD F. McCORMICK B. D. SAKLATWALLA



paint sales division of Aluminum Industries, Inc., Cincinnati. He has been associated with the company for three years, in the capacity of Detroit district manager of the paint division, and succeeds A. B. ANDERSON, who recently resigned.

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DR. S. L. HOYT, director of metallurgy of the A. O. Smith Corp., Milwaukee, gave an illustrated talk at the first fall meeting of the Milwaukee Chapter, American Society for Metals, at the Milwaukee Athletic Club on Sept. 19, following a dinner. He discussed new high-temperature metal, welding and phases of testing steels for impact.

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J. D. JONES has recently been appointed chief engineer of the Youngstown Sheet & Tube Co. He was born and reared in Pittsburgh and went to school at Pittsburgh Academy. From the outset he was interested in the steel business and worked in steel plants in Wheeling, Chicago, Buffalo, Pittsburgh and other cities. In 1912 Mr. Jones went to Sault Ste. Marie as chief engineer of the Algoma Steel Co. Four years later he became chief engineer at the Gary works of the Illinois Steel Co. and resigned in the latter part of 1919 to return to the Algoma Steel Co. at the Soo as general superintendent, later becoming general manager and vice-president. He joined the Youngstown Sheet & Tube Co. early in August. Mr. Jones is a member of the American Society of Mechanical Engineers, American Institute of Mining and Metallurgical Engineers, and the Engineering Institute of Canada, the American Iron and Steel Institute and the (British) Iron and Steel Institute.

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R. P. KILSBY has been appointed manager of Western sales for the Babcock & Wilcox Co., Beaver Falls, Pa. He will be in charge of all districts covered by the company's offices west of the Mississippi and will make his headquarters in the Marquette Building, Chicago. Mr. Kilsby formerly was attached to the general sales office at Beaver Falls.

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W. P. EWING, who since April, 1934, has been general manager of sales for the Superior Steel Corp., Pittsburgh, has been made vice-president. He has been identified with the company for more than 18 years.

## OBITUARY

JOHN R. TILLMAN, for a number of years in charge of the tool engineering department of the Bulard Co., Bridgeport, Conn., and



J. R. TILLMAN

since April assistant to D. B. Bulard, vice-president in charge of engineering, died of a heart ailment, Sept. 17, in St. Lukes Hospital, Cleveland, while attending the Machine Tool Show.

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ARTHUR WHITCRAFT, vice-president and general manager of the Utilities Foundry Corp., Emporium, Pa., died of a heart attack on Aug. 26. He had been identified with the foundry industry since 1913. For a number of years he was connected with the American Manganese Steel Co.

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ALFRED R. HUGHES, president of the Warren City Tank & Boiler Co., died at his home in Warren, Ohio, on Sept. 17, after a short illness.

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HENRY C. KEENAN, president of the Sterling Motor Truck Co., Inc., and vice-president of the Sterling Motors Corp., Milwaukee, died on Sept. 16, following a heart attack.

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THOMAS WILLIAM BROOKS, one of the few remaining pioneers of the steel pipe industry, died at his home at Oakland, Cal., Sept. 16. Mr. Brooks, who entered the employ of the National Tube Co. in 1877, was identified with the early development and installation of converse joint lines. On being transferred to the Pacific Coast in

1889 he was associated with Dunham, Carrigan & Hayden Co., outlet for the Tube company. In 1911 he became assistant manager of sales of the tubular goods department of the United States Steel Products Co. and remained in this capacity until 1931 when he retired after 54 years of continuous service.

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WILLIAM H. SANFORD, for many years assistant vice-president of the American Car & Foundry Co., died at the Emergency Hospital, Buffalo, on Sept. 22, as the result of a hip fracture received in a fall last year. He joined the organization when the company for which he worked, the Union Car Co., Depew, N. Y., was consolidated with the American Car & Foundry Co. in 1899.

The War Department has approved an allotment of \$7,550,000 from the second deficiency act to be used in financing the construction of a power house, fishway, railroad and highway, together with other activities, at the Bonneville dam. The department has also approved an allotment of \$500,000 to be used in connection with work on the Hudson River channel. It calls for the deepening of the Weehawkin-Edgewater channel from 26 ft. to 30 ft. Funds of \$480,000 were approved for the Intracoastal waterway from Cape Fear River to Winyah Bay, S. C., and will provide for completing of the 8-ft. channel from the Delaware River to Miami, Fla.

An order for automobile dies and stampings that will provide a large volume of work for the tool and machine shops of the Edward G. Budd Mfg. Co., of Philadelphia, for six months, has been received from the Amtorg Trading Corp., New York. The order covers dies and initial stampings for a complete body and chassis frame for a long-wheelbase, four-door sedan, including fenders, hood, radiator shell, running boards and trunk rack. It also includes dies and initial stampings of disk wheels to be produced by the Budd Wheel Co. in its Detroit plant.

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until Oct. 8 for 553 tons of rolled steel armor and 169 tons of steel castings for lock at Pickwick Landing, Tenn.; until Oct. 9 for 129 tons iron castings for same lock.



# THIS WEEK IN WASHINGTON

*New Deal attacked on wide front as President prepares for initial 1936 campaign trip.*

° ° °

*General Johnson joins critics, although insisting motives are friendly.*

° ° °

*Hopkins surrenders to organized labor in WPA wage controversy.*

° ° °

*Administration gets break in escaping from necessity of enforcing potato control.*

° ° °

*Committee of lawyers holds labor relations act unconstitutional.*

° ° °  
BY L. W. MOFFETT  
Resident Washington Editor,  
The Iron Age  
° ° °

WASHINGTON, Sept. 24.—Flaring forth from several major fronts, attacks on the New Deal faced President Roosevelt upon his return to Washington from Hyde Park, preparatory to an extensive transcontinental trip. . . . Almost simultaneously, broadsides were fired by the American Liberty League, the National Association of Manufacturers, and the Chamber of Commerce of the United States. . . . Administration sources construed the moves as a mass drive by business of the nation against the New Deal, timed to put business in politics on a wider scale than ever before the forthcoming Presidential campaign and to follow legislation closely. . . .

If this interpretation is correct it is significant. . . . It will denote a passing of the laissez faire of business men generally toward politics. . . . For while business and industry long have had organizations to represent them in Washington, the fact remains that for the most part individual members have manifested but little individual activity in politics. . . . But with a torrential downpour of legislation coming upon it, business is being urged increasingly to

participate in politics as a matter of self-protection. . . . An outstanding keynote in this direction was vigorously sounded by E. T. Weir, chairman of the board of the National Steel Corp., in his recent address in Pittsburgh before the National Industrial Advertisers' Association, when he charged that New Deal policies are delaying recovery and leading to collectivism and dictatorship. . . .

## ▼ ▼ ▼ To Guard Against Harmful Legislation

The encouragement for business to get more actively into politics is not designed to draw forth partisan participation. . . . Rather it is to keep close watch to guard against harmful legislation, no matter what its source. . . . It does not urge obstruction but rather the championing of reform legislation where it is constructive without regard to its sponsorship. . . . Business is being told it must have much more than a mere "breathing

spell," only to be followed by further solar plexus blows. . . .

And on the point of partisanship, business will find if it cares to make even a superficial search that many of the sweeping pieces of New Deal legislation have received Republican support as a matter of political expediency. . . . This is true of such measures as the Agricultural Adjustment Act, the \$4,800,000,000 works relief act, the national labor relations act, the Guffey coal act, the share-the-wealth tax act, etc., each of which has been bitterly assailed. . . . The surprising thing is that the New Deal has not emphasized this fact more than it has so far. . . . It may later pull this ammunition out of its campaign bag and fire it to the best advantage. . . .

Obviously, however, the New Deal is in power and is charged with responsibility for legislation enacted and contemplated. . . . Therefore attacks are directed at it and business is being urged to challenge some of it which is already on the statute books and to call a



sharp halt on detrimental proposals to be submitted to the forthcoming session of Congress. . . .

### General Johnson Joins Critics

The American Liberty League and the Emery attacks were made public last Thursday, while the directors of the Chamber of Commerce of the United States at a two-day session beginning Friday determined to ask its membership of 750,000 to give its views on the New Deal. . . . More than incidentally, fiery General Hugh S. Johnson came forth on the same day with a blast against numerous features of the New Deal as he announced plans for a country-wide stumping tour as a "friendly but vigorous" critic of the Administration. . . . Preparing to leave his job as works progress administrator for New York on Oct. 15, the doughty General made it clear that his criticism also will include considerable paprika for "special privilege," which he said "Hooverism" means. . . . Fear is felt in New Deal circles that the General will give it the praise that damns and may have unfavorable political repercussion. . . .

The American Liberty League attack, the first of a series against various measures sponsored by the New Deal, branded the national labor relations act as unconstitutional, amounting to class legislation in favor of organized labor and distinctly against industry. . . . Mr. Emery's attack came in the form of a letter telling members of the National Association of Manufacturers that they must be prepared to meet further Government control of industry, "perhaps more extensive than any yet suggested." . . .

The President's promise of a "breathing spell" for business was referred to as an interval between a "preceding period of strangulation and one of approaching exhaustion." . . . He vigorously condemned as unconstitutional, either wholly or in part, the national labor relations act, the Guffey coal act, the AAA and the social security act. . . . Proposals for a new NRA and the Walsh bill to compel adherence to code wages and hours in connection with Government work were declared to be reflections of continuing determination to use all the tremendous power of compulsion which the Government might invoke to establish indirectly a general regulation of hours, wages and working conditions. . . . Attack also was made on the pending bill of Senator O'Mahoney to license industry engaged in interstate commerce. . . . The American Federation of Labor is especially

active in sponsoring the latter measure. . . . Evidently intended to show that the "breathing spell" is not all that it seems, Mr. Emery spoke of widespread investigations now under way. . . . He did not mention the number, but it actually is 17. . . .

### See Improvement in Business

Directors of the Chamber of Commerce came to Washington in better spirits than they did on their previous visit, for they reported a definite improvement in business, most of them declaring it was "in spite of rather than on account of the New Deal." . . . They then proceeded to prepare a critical report on the New Deal. . . . While the board was represented as having adopted a "constructively critical" attitude, it made specific complaints. . . . Reiterating many previous attacks, the board set forth such charges as the following: That widespread and insistent effort is being made by the Federal Government to usurp the powers of the State; that Congress is delegating "enormous and sometimes uncontrolled authority in the President"; that Government expenditures are excessive. . . . Condemnation was directed at Government competition with business, repudiation of the gold clause in Government bonds, social security legislation, tax legislation, AAA regulations and methods of relief. . . .

John W. O'Leary, Chicago, president of the Machinery and Allied Products Institute, headed a committee which made a report on legislative trends covering the three sessions of Congress under the New Deal. . . . The steady endeavor to substitute Federal jurisdiction for State and local jurisdiction was declared to have happened so often that it "assumes the character of a concerted policy." . . . The Federal Government was charged with having taken advantage of emergencies to "consolidate a movement in Federal legislation, which, with the decrease of emergency factors, is evidently being strengthened rather than moderated." . . .

On the huge outpouring of money, the committee found this trend: "Exercise of the spending power without regard to revenues, for purposes within the power of neither Federal nor State governments, and on a scale that brings to every business and to every individual the dangers flowing from a continuing unbalanced budget." . . . This and other trends were dwelt upon at some length to the end that business should be fully apprised of the situation and that it should do something definite about it. . . .

Planks in the platform of General Johnson in his forthcoming campaign on the hustings here and there fit in with business attacks on the New Deal. . . . Some of them do not but instead indicate that the General will whack business in spots for not going along with some New Deal efforts such as the move to revive principles of NRA. . . . He agrees with widespread criticism of the attempts to solve the problem of returning the unemployed to work through the WPA and the PWA, which he classed as "futile aspects" in the category of the Administration's mistakes. . . . He wants the budget balanced. . . . He sneers at talk of amending the Constitution so as to guarantee the permanence of New Deal legislation, saying no amendment is necessary. . . . He took a sharp crack at what he called mishandling of the Schechter NRA case before the Supreme Court, claiming the pestered Blue Eagle could have been saved if proper presentation of the case had been made. . . . Which, of course, was a dart pointed at his erstwhile companion in the NRA, Donald R. Richberg. . . . Finally he lambasted in ugly language the lawyers who prepared the American Liberty League report on the national labor relations act. . . .

### Hopkins Surrenders to Organized Labor

Whatever General Johnson may think of WPA, considered by many virtually to have collapsed, he took advantage of an amazing order by Administrator Harry L. Hopkins which reversed a former position of the Administration and permits State administrators to reduce hours of work to any desired minimum. . . . This was accepted as a surrender to organized labor, a further effort to coddle its favor. . . . Organized labor has not yet got its demand for the "prevailing wage" on relief work "jobs," but under the new order it saw skilled workers put on a poorly hidden dole inasmuch as under the principle fixed for New York as a precedent for other States, skilled workers are required to remain on the job for an equivalent of three hours per day for five days a week. . . . This frantic move may go in the direction of creating 400,000 "jobs" each week until Nov. 1, but the real job will rest with taxpayers to meet the cost. . . .

It is such things which have multiplied business attacks. . . . Business and industry are overwhelmingly of the view that the dole and boondoggling could be greatly pared down and construc-

tive, widespread employment created if funds were turned in greater amounts to projects requiring production in the heavy goods industries. . . .

### Hedge on Potato Control

Here are tears and slow music for spud control politicians, chief among them being Republicans. . . . The unwanted child of AAA, the spud regimentation scheme, has been given a blow. . . . AAA doesn't propose to send out an army of sleuths to catch spud bootleggers. . . . It has neatly evaded the job. . . . It has no funds to administer the act, though application has been made to the Treasury by Secretary of Agriculture Wallace to do so until Congress meets. . . . Meanwhile, however, the plan is not to resort to compulsory control of the act, and failure of passage of the third deficiency bill carrying \$5,000,000 for its administration has proved a boon to AAA. . . . Secretary Wallace has indicated that voluntary control over spud crops may be urged through the fetching principle of payments to growers to curtail production—thus expanding the plow-under and curtailment program of AAA and offering another chance to tap the treasury by millions for not planting potatoes which were never intended to be grown. . . .

### Coal Control to Be Tested

Coal control is about to be tried out. . . . Court tests soon will be here with a vengeance. . . . The President has set up the Bituminous Coal Commission under the Guffey-Snyder Act and also the Bituminous Coal Labor Board. . . . The commission consists of George E. Acret, California; Charles S. Hosford, Jr., Pennsylvania; Walter H. Maloney, Missouri; C. E. Smith, West Virginia, and Percy Tetlow, Ohio. . . . Tetlow formerly was President of District No. 17, United Mine Works, the organization which forced the act through Congress. . . . The coal labor board consists of Lee Gunther, Tennessee, representing producers; John J. O'Leary, Pennsylvania, representing employees, and John M. Paris, Indiana, representing the public. . . .

The coal act is an example of differences within industry. . . . Steel companies owning captive mines strongly opposed the legislation. . . . Commercial coal operators were divided, with the chief hostility appearing among Southern producers. . . . Kentucky coal operators have got the act into court for a test. . . . Northern

producers generally, though not wholly, were for the act. . . . And at the meeting of the board of directors of the Chamber of Commerce of the United States a report supporting the act was made. This shows that when business and industry get into politics they will have to thresh out some differences among themselves. . . .

### Will Study Entire Field of Federal Taxation

Exploration of the whole field of Federal taxation and expenditures will be made by the Chamber of Commerce of the United States through a referendum as the result of a report made to the chamber's board at a meeting last Friday by a committee on Federal finance, headed by Fred H. Clausen, president, VanBrunt Mfg. Co., Horicon, Wis. It is likely that a referendum also will be taken with regard to chamber proposals for new NRA legislation.

These moves constituted a portion of the activities of the board which through a series of reports made a critical analysis of New Deal legislation.

The report of the committee on Federal finance sharply attacked phases of the recently enacted tariff act as being discriminatory and inequitable and declared it was necessary for a general review of the Federal tax system in order to eliminate unjust provisions.

Passing on the new tax law, the report of the committee made the following points:

1. Violation of the fundamental principle that the primary purpose of taxation is to raise revenue for the legitimate expenditures of the Government. Recent tax proposals have been avowedly for the purpose of accomplishing wide-reaching social and economic reforms.
2. Failure to bring forth an adequate tax program that would combine reduction in public expenditures, a balanced budget and the imposition of new taxes in a manner that would least retard business recovery.
3. Hasty and inadequate consideration without sufficient prior notice to the country of administrative intentions.
4. Disregard of the prerogative and rights of the States for raising necessary revenue.
5. Proposals based on the principle that growth of industry to large size is inherently contrary to the well-being of the nation.
6. Taxation of such excessive rates that going concerns would be disrupted without suggesting to business any substitute for the methods which are now employed.

Deep concern must be felt over the adverse effects on business enterprises of national policies which

resist rather than promote increased employment in private industry, the committee statement said.

"The volume of public expenditures," it added, "is also of fundamental importance, not alone to business but to every citizen. For the current fiscal year Congress has made appropriations totaling over \$10,000,000,000. As to a large part of these appropriations, no obligation rests on the Administration to spend the money made available. A prudent policy of spending could result in large savings and the expected deficit would be correspondingly reduced."

Early in October a special committee of the chamber will be chosen to study the question of new NRA legislation. The committee will make a recommendation and it is likely the matter will be submitted to a referendum of the chamber's membership. It was conceded that there is a wide difference of views in business circles on some features of the new NRA. It may be added that there is also a decided conflict in NRA proposals voted last January by the chamber and proposals of the New Deal Administration to restore NRA. Because of this difference it may well be seriously doubted that some of the chamber proposals as voted for at that time would get serious consideration at the hands of the Administration. Even aside from the principles involved, chance of agreement between the Administration and the Chamber in all probability is considerably lessened by the split between the two and the sharp attacks of the Chamber on the Administration.

### Charges Damage to American Manganese Industry

Charges that Soviet Russia is attempting to undermine our national defense by causing the abandonment of manganese mines in the United States through the proposed reduction in the duty on manganese ore in the reciprocal trade agreement recently negotiated between the State Department of the United States and the Soviet Government were made last week by J. Carson Adkerson, president of the American Manganese Producers Association.

"National defense is dependent upon manganese," said Mr. Adkerson. "Without manganese steel cannot be manufactured. The proposed cut in the manganese duty would effectively close manganese mines in the United States. The revival of the manganese industry in this country, after the mines have become filled with water and



allowed to collapse, could not be accomplished in a short period of time.

"The removal of the duty and destruction of the manganese industry in the United States places us largely at the mercy of Soviet Russia in time of an emergency."

### Labor Board Sets Up Regional Offices

The personnel of its 21 regional offices has been made public by the National Labor Relations Board. With some changes, the cities selected for field agencies are those where offices were established by the former National Labor Relations Board. Under provisions of the Wagner-Connelly Act, both the Washington and the field staffs of the former board were transferred to the new board.

As explained in the recent publication of the board's rules and regulations, the regional director and the regional attorney are designated as agents of the board, with power to prosecute inquiries, investigate employee representation (including the taking of secret ballots) and to gather evidence. Information on alleged unfair labor practices, concerning local employers, will ordinarily be investigated by the director in that region. He may either dismiss the charge, if his investigation finds it groundless, or he may issue a complaint in the name of the board. At hearings on complaints the regional attorney will represent the board. Reviews of the local cases may be carried to Washington.

### Steel Corporation Moves Offices

ALL subsidiary companies of the United States Steel Corp. will move their Philadelphia district sales offices from the Widener Building to the Broad Street Station Building by the end of September. This change of address affects Carnegie and Illinois steel companies, American Sheet & Tin Plate Co., American Steel & Wire Co., National Tube Co., American Bridge Co., Lorain Steel Co., Tennessee Coal, Iron & Railroad Co., and Universal Atlas Portland Cement Co.

The Bureau of Yards and Docks, Navy Department, has awarded a contract to the Virginia Engineering Co., Inc., Newport News, Va., at \$617,500 for the construction of barracks buildings at the Naval Air Station, Pensacola, Fla.

## Labor Relations Act Held Unconstitutional by Committee of Lawyers

WASHINGTON, Sept. 24.—Branding it unconstitutional, the unanimous report by the National Lawyers' Committee of the American Liberty League on the national labor relations (Wagner-Connelly) act made public Thursday was the source of heated controversy. The first of a series of reports to be made by the committee on New Deal legislation, sharp comment came from such sources as the American Federation of Labor, Secretary of the Interior Harold L. Ickes and a section of the daily press. Coming along with the attack on national labor relations act were pointed assaults on New Deal legislation by James A. Emery, chief counsel of the National Association of Manufacturers and the board of directors of the Chamber of Commerce of the United States.

Taken together, these activities were construed by Administration sources to be an organized concentration of business on a nationwide scale, launched into the Presidential campaign to defeat the New Deal.

Hot denials were forthcoming that the moves were of a political character. To refute the charge it was pointed out the moves are being participated in by prominent lawyers and business men of differing party affiliations. Other sources, assuming a more moderate stand, suggested that business was taking advantage of the "breathing spell" to express in unmistakable terms what it thinks of the New Deal.

### Steel Industry Responsible?

The opening shot fired by the National Lawyers' Committee, with a membership of 58, consisted of an exhaustive analysis of the national labor relations act. The report was prepared by a subcommittee of the National Lawyers' Committee. The subcommittee has a membership of eight. The fact that Raoul E. Desvernine is chairman of the full committee and Earl F. Reed is chairman of the subcommittee was pounced upon by a section of a critical press that the American Liberty League assaults on the labor and other acts are being led by the iron and steel industry. This view sprang from the fact that Mr. Desvernine is a law partner of former Governor Nathan L. Miller and has frequently represented United States

Steel Corp. subsidiaries in labor and other cases in Washington, while Mr. Reed represents the Weirton Steel Co. Mr. Reed appeared for the Weirton company in its successful attack on Section 7-a of the National Industrial Recovery Act in the Federal Court in Wilmington, Del. Judge John P. Nields held the section unconstitutional and void. It marked the first ruling on the collective bargaining section of the recovery act. Present on the subcommittee also is Hal H. Smith, Detroit, who represents automotive industries in labor and other cases. This fact was also fitted into the picture to draw another conclusion that automotive and steel, the two major open shop industries of the country, had joined in an assault on organized labor through the report on the national labor relations act.

The formal statement pointed out that the National Lawyers' Committee was chosen without reference to the politics of its members and without even knowing the political opinions of the persons selected, but solely because of the recognized ability and professional competency of the members of the committee to express an opinion upon questions of constitutional law. In the course of replies to questions Mr. Desvernine named well-known Democrats who are members of the committee, and in his prepared statement he said he recognized some 15 names as persons publicly known as Democrats. Three members of the subcommittee were declared to be Democrats. The point was that the committee could not be considered a packed Republican committee.

Secretary Frank E. Morrison of the American Federation of Labor declared that the lawyers' committee simply represents the views "held by special privilege and big business, which have always opposed every piece of legislation introduced in Congress and in the States to bring a little more happiness into workers' homes."

Other legislation on which the lawyers' committee will make reports includes the public utility holding company act, the social security act, the bituminous coal conservation act, the TVA and Government competition with private business, the AAA act, the communications act, the securities act of 1933, the securities exchange act of 1934 and others.

# Capital Goods

LAST week's estimate of 51.3 for THE IRON AGE index of capital goods activity represents a decline of 0.3 points from the revised figure for the preceding period. A slight recession in steel ingot output, a further drop in automobile production, and a more noticeable lapse in construction contracts awarded contributed to this loss. Offsetting influences were an upward surge in lumber shipments and sustained strength in Pittsburgh district activity.

According to figures released by Cram's Reports, automobile output at this time last year was 30 per

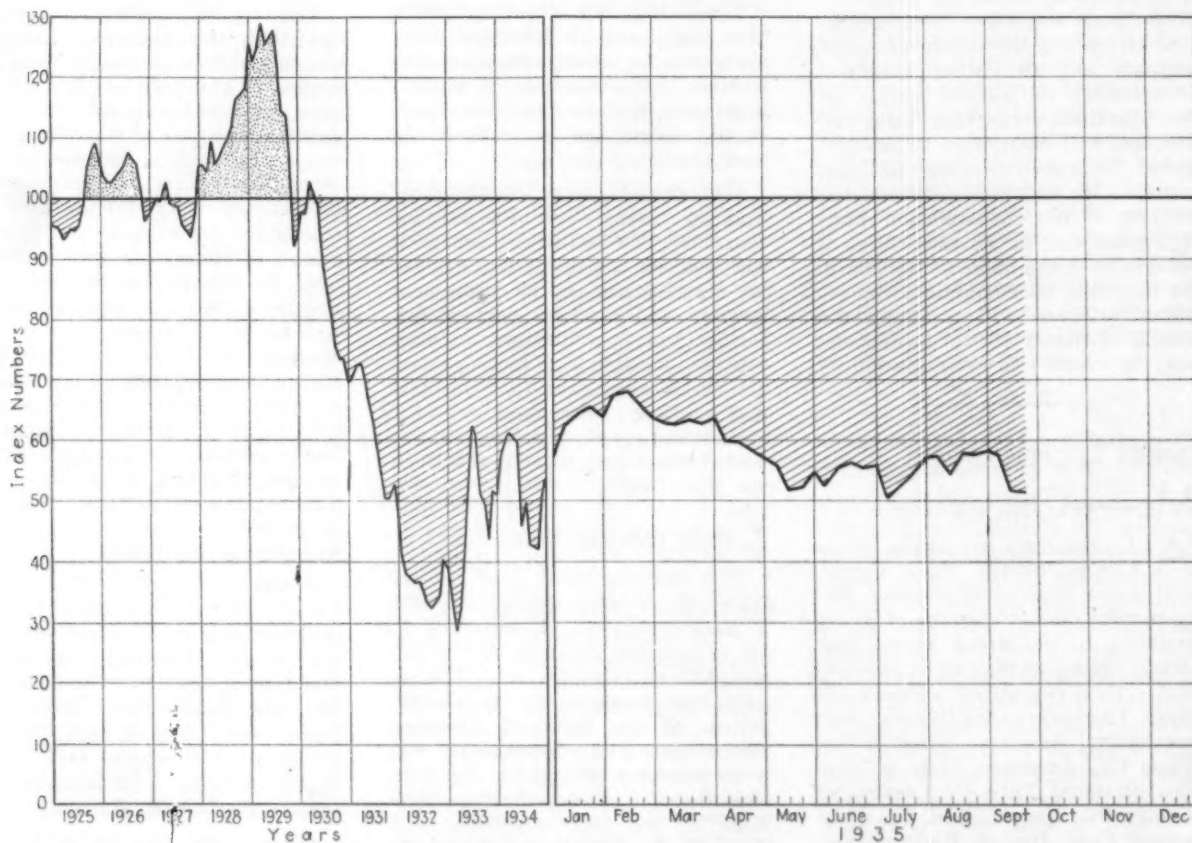
## The Iron Age Weekly Index Numbers of Capital Goods Activity

(1925-'27 = 100)

Last week (est.)	51.3
Preceding week (rev.)	51.6
Same week last month	57.7
Same week 1934	43.0
Same week 1933	48.3
Same week 1932	32.3
Same week 1931	54.3
Same week 1930	80.6
Same week 1929	112.7

cent greater than now. Thus, the restrictive influence exerted upon the capital goods index by this factor alone is obvious, and until new model production gets definitely under way too much improvement should not be looked for. Moreover, a further unfavorable circumstance last week derived from the construction component in which activity failed considerably to measure up to recently publicized predictions.

The figure for the combined index of 51.3 indicates a level 33 per cent below the February high of 68.0 and only 2 per cent above the



(1925-27 Average = 100)

The Iron Age Index of Capital Goods Activity. The years 1925 to 1934 are plotted by months, the current year by weeks.

Components of the index: Steel ingot production rate, from THE IRON AGE; revenue freight carloadings of forest products, from Association of American Railroads; automobile production, from Cram's Automotive Reports; heavy construction contract awards, from Engineering News Record; index of productive activity in Pittsburgh district, from Bureau of Business Research of University of Pittsburgh.



# Index Recedes Further ▲▲▲

year's low to date made during Independence Day week. Nonetheless, it is still substantially above the corresponding level for 1934, while equal, at this point, to that for 1933.

## Large Potential Railroad Demand

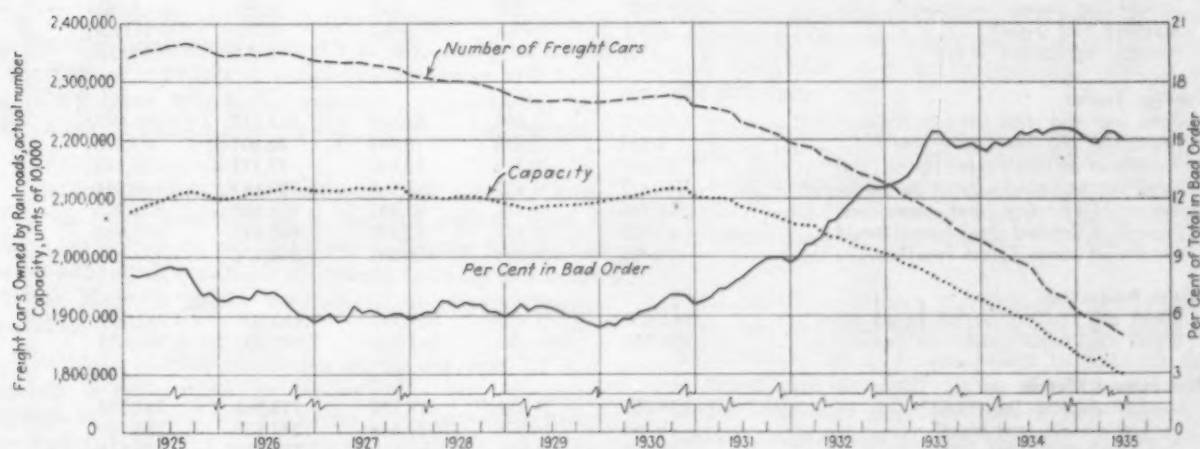
PRIOR to the depression the railroads were among the best customers of the steel and other capital equipment industries. Not only did annual rail replacements involve heavy steel tonnages, but the manufacture of new rolling stock and maintenance of way and structures supported a wide range of foundry, machinery, and equipment industries. Railroad demand commenced to slacken as early as 1927, however, and in 1928, for the first time, a larger tonnage of steel was consumed by the automobile industry than by the railroads. Capital operations were fairly well maintained by the railroads and other public utilities during 1930 in response to President Hoover's plea to provide as much employment as possible, but railroad demand has been sharply reduced since that year.

That this long continued curtailment of purchasing has created a potential demand which should manifest itself eventually in substantial orders for capital equipment is apparent from the chart at the bottom of the page. This chart shows the number and capacity of freight cars owned by the railroads and the per cent of the total number in bad order, on a monthly basis since 1925. During the first half of the period shown on the chart there was a gradual and steady decline in the number of cars owned but little change in total capacity because the older freight cars were being replaced by new cars of larger capacity. Thus, in September, 1930, the railroads owned 90,000 less freight cars than at the peak in August, 1925, but the capacity of these cars, amounting to 211,942 million pounds, was actually greater than the total capacity of 211,163 million pounds reported in August, 1925.

During the past five years, however, there has been a sharp decline in both the number and capacity of freight cars owned by the

railroads, while the number of cars in bad order and needing repairs has more than doubled. In June, 1935, the capacity of the 1,868,000 freight cars owned by the railroads aggregated 180,114 million pounds, which was nearly 18 per cent less than at the end of 1930 and 11 per cent less than at the end of 1932, the worst year of the depression. Moreover, 15 per cent of these cars are in bad order as compared with what may be considered a "normal" proportion in need of repairs amounting to slightly more than 6 per cent.

It is obvious that, allowing for some permanent loss of freight traffic to other means of transportation, the railroads are not now equipped to handle anything like normal shipments. Even a partial restoration of the pre-depression rolling stock would require the expansion of freight-carrying capacity by at least 20,000 million pounds, representing 200,000 new freight cars as well as the completion of repairs on nearly as large an additional number out of the 276,535 freight cars now in bad order.



Number and Capacity of Freight Cars and Per Cent in Bad Order

Source: American Railway Association, Car Service Division; data obtained from Survey of Current Business

# Current Metal Working Activity Statistically Shown

These Data Are Assembled by The Iron Age from Recognized Sources  
and Are Changed Regularly as More Recent Figures Are Made Available

	August, 1935	July, 1935	August, 1934	Eight Months, 1934	Eight Months, 1935
<b>Raw Materials:</b>					
Lake ore consumption (gross tons) <sup>a</sup> .....	2,615,927	2,198,189	1,443,943	16,766,927	19,155,629
Coke production (net tons) <sup>b</sup> .....	.....	2,612,411	2,323,100	22,344,300	.....
<b>Pig Iron:</b>					
Pig iron output—monthly (gross tons) <sup>a</sup> .....	1,761,286	1,520,263	1,054,382	12,077,521	13,080,549
Pig iron output—daily (gross tons) <sup>a</sup> .....	56,816	49,041	34,012	49,702	53,829
<b>Castings:</b>					
Malleable castings—production (net tons) <sup>a</sup> .....	.....	28,915	23,910	261,339	.....
Malleable castings—orders (net tons) <sup>a</sup> .....	.....	25,526	21,306	250,815	.....
Steel castings—production (net tons) <sup>a</sup> .....	.....	31,125	43,748	339,401	.....
Steel castings—orders (net tons) <sup>a</sup> .....	.....	34,570	25,538	340,903	.....
<b>Steel Ingots:</b>					
Steel ingot production—monthly (gross tons) <sup>a</sup> .....	2,919,326	2,270,224	1,381,350	19,273,357	21,214,241
Steel ingot production—daily (gross tons) <sup>a</sup> .....	108,123	87,316	51,161	92,660	101,992
Steel ingot production—per cent of capacity <sup>a</sup> ..	48.84	39.44	23.24	42.08	46.07
<b>Employment in Steel Industry:</b>					
Total employees <sup>a</sup> .....	.....	414,937	404,793	422,615	.....
Total payrolls (thousands of dollars) <sup>a</sup> .....	.....	\$42,725	\$34,362	\$327,676	.....
Average hours worked per week <sup>a</sup> .....	.....	31.5	26.5	32.1	.....
<b>Finished Steel:</b>					
Trackwork shipments (net tons) <sup>a</sup> .....	4,028	4,054	5,364	39,237	20,992
Sheet steel sales (net tons) <sup>a</sup> .....	207,140	206,313	66,064	1,324,225	1,558,438
Sheet steel production (net tons) <sup>a</sup> .....	206,613	145,505	77,197	1,411,714	1,578,009
Fabricated shape orders (net tons) <sup>a</sup> .....	.....	57,556	95,489	765,934	.....
Fabricated shape shipments (net tons) <sup>a</sup> .....	.....	94,733	122,482	668,091	.....
Fabricated plate orders (net tons) <sup>a</sup> .....	.....	18,890	16,293	167,649	.....
Reinforcing bar awards (net tons) <sup>a</sup> .....	101,140	7,645	27,315	150,730	221,540
U. S. Steel Corp'n. shipments (tons) <sup>b</sup> .....	624,497	547,794	378,023	4,426,856	4,726,290
Ohio River steel shipments (net tons) <sup>c</sup> .....	92,501	77,464	45,840	442,277	578,613
<b>Fabricated Products:</b>					
Automobile production, U. S. and Canada <sup>a</sup> .....	247,743	390,118	244,715	2,317,109	2,971,332
Construction contracts, 37 Eastern States <sup>d</sup> .....	\$168,557,200	\$159,249,900	\$119,591,800	\$1,093,356,000	\$1,024,313,900
Steel barrel shipments (number) <sup>a</sup> .....	.....	555,649	364,081	4,798,839	.....
Steel furniture shipments (dollars) <sup>a</sup> .....	.....	1,208,284	1,101,469	8,801,619	.....
Steel boiler orders (sq. ft.) <sup>a</sup> .....	.....	519,061	565,843	2,858,961	.....
Locomotive orders (number) <sup>m</sup> .....	0	5	5	88	21
Freight car orders (number) <sup>m</sup> .....	100	500	113	22,996	7,183
Machine tool index <sup>n</sup> .....	125.8	119.8	41.4	†37.1	†112.2
Foundry equipment index <sup>o</sup> .....	113.0	93.3	43.1	†54.7	†102.4
<b>Foreign Trade:</b>					
Total iron and steel imports (gross tons) <sup>p</sup> .....	31,312	31,894	32,418	217,715	246,097
Imports of pig iron (gross tons) <sup>p</sup> .....	8,568	5,519	18,418	86,801	67,573
Imports of all rolled steel (gross tons) <sup>p</sup> .....	17,657	18,719	10,910	77,773	129,348
Total iron and steel exports (gross tons) <sup>p</sup> .....	247,312	296,802	243,300	1,729,667	2,140,048
Exports of all rolled steel (gross tons) <sup>p</sup> .....	82,866	83,171	82,381	651,680	577,704
Exports of finished steel (gross tons) <sup>p</sup> .....	64,400	68,129	72,132	565,891	497,988
Exports of scrap (gross tons) <sup>p</sup> .....	156,685	205,779	155,542	1,050,202	1,481,132
<b>British Production:</b>					
British pig iron production (gross tons) <sup>q</sup> .....	543,400	547,300	503,300	3,930,000	4,262,700
British steel ingot production (gross tons) <sup>q</sup> .....	759,900	803,300	667,000	5,892,500	6,364,400
<b>Non-Ferrous Metals:</b>					
Lead production (net tons) <sup>a</sup> .....	34,856	34,424	27,328	272,906	261,396
Lead shipments (net tons) <sup>a</sup> .....	38,195	34,575	33,606	241,529	268,189
Zinc production (net tons) <sup>a</sup> .....	35,922	35,055	26,169	234,933	280,964
Zinc shipments (net tons) <sup>a</sup> .....	39,200	32,241	21,663	238,525	286,524
Deliveries of tin (gross tons) <sup>v</sup> .....	5,320	5,290	4,045	30,065	39,000

\*Preliminary. †Three Months' Average.  
Source of figures: <sup>a</sup>Lake Superior Iron Ore Association; <sup>b</sup>Bureau of Mines; <sup>c</sup>THE IRON AGE; <sup>d</sup>Bureau of the Census; <sup>e</sup>American Iron and Steel Institute; <sup>f</sup>National Association of Flat-Rolled Steel Manufacturers; <sup>g</sup>American Institute of Steel Construction; <sup>h</sup>United States Steel Corp'n.; <sup>i</sup>United States Engineer, Pittsburgh; <sup>j</sup>When preliminary, from Automobile Manufacturers Association—Final figures from Bureau of the Census; <sup>k</sup>F. W. Dodge Corp'n.; <sup>l</sup>Railway Age; <sup>m</sup>National Machine Tool Builders Association; <sup>n</sup>Foundry Equipment Manufacturers Association; <sup>o</sup>Department of Commerce; <sup>p</sup>British Iron and Steel Federation; <sup>q</sup>American Bureau of Metal Statistics; <sup>r</sup>American Zinc Institute, Inc.; <sup>s</sup>New York Commodities Exchange.



## SUMMARY OF THIS WEEK'S BUSINESS

### Trend of Steel Output Hinges On Automotive Rebound

Transition to New Car Models Is Still Delayed and Ingot Rate Dips to 51½  
Per Cent—Bar and Sheet Buying Stimulated—Scrap Exports Checked

THE automobile industry's delay in getting into production on new models is holding back steel orders and adversely affecting steel production, which has dipped from 52 to 51½ per cent of capacity. District operations are off one point to 59 per cent at Chicago and two points to 55 per cent in the Valleys, but have risen one point to 71 per cent in the lower Ohio River area. In other producing centers output is substantially unchanged.

Though automotive demand, in the aggregate, is slowly improving, round-lot orders for the new models have not yet appeared. It had first been thought that 1936 assemblies would get under way early this month, but, as is customarily the case, late alterations in models have held back production programs. The two leading makers of low-priced cars are expected to launch their assemblies of new cars next week and others plan to follow in quick succession, but whatever the time may be when motor car output rebounds the outlook for the fourth quarter is regarded as most promising, current estimates placing production for that period at 750,000 cars and trucks.

CONFIDENCE in automotive prospects accounts for the continued strength of the scrap markets in the face of a rather general suspension of mill buying. THE IRON AGE scrap composite remains for the third week at \$12.75 a gross ton, its high for the year to date.

The imminence of war abroad is, for the time being at least, reacting as a bearish, rather than a bullish, influence on scrap. Several vessels which had been loaded with scrap for shipment to Italy are being held at Eastern ports because of a sharp rise in insurance rates.

Tin plate output continues at 55 per cent of mill capacity despite clear evidences of ebbing demand. Damage to corn and tomato crops from excessive moisture has further cut down seasonally diminishing requirements and it is now feared that can companies may have to carry considerable stocks of tin plate into next year. The growing vogue of beer cans has not yet reached large enough proportions to affect tin mill schedules materially.

SHEET production, strongly supported by miscellaneous demand, is holding at 70 per cent. Demand for both galvanized sheets and hot-rolled bars has been lifted of late by orders from consumers who will gain

a price advantage by stocking before Oct. 1. In the case of bars anticipatory covering is limited mainly to smaller buyers, since large users, in a position to purchase at the new quantity discounts, gain nothing by ordering in advance of their needs. Buying of cold-finished bars has been stimulated by increased quantity extras effective Oct. 1 and by the growing needs of the machine tool industry.

IN the construction field, grade separation programs are slow in getting under way, but otherwise there is growing activity. Structural steel awards total 19,400 tons, compared with 14,750 tons a week ago. New projects of 11,250 tons compare with 9955 tons in the preceding week. Inquiries are still preponderantly for public work.

Reinforcing steel lettings total 12,840 tons as against 5810 tons last week. A major share of the recent 83,700-ton order for the Los Angeles water district is for delivery within a year.

Awards of structural steel, plate work, reinforcing and sheet piling reported by THE IRON AGE to date this year are maintaining their recently won margin over 1934, the total for the year being 919,032 tons and that for the corresponding period last year 886,837 tons.

Railroad buying remains at low ebb. The Chesapeake & Ohio has entered the market for 21,842 tons of rails and 1000 tons of track accessories, and the Santa Fe has announced that it will spend \$3,500,000 on betterment of right-of-way for faster trains.

PIG IRON producers, particularly in the Great Lakes region, are now well booked for the fourth quarter. At Chicago the business taken to date in September is three and one-half times the tonnage entered in March, the best previous month this year. The fuel market, regardless of the duration of the bituminous coal strike, is regarded as certain to strengthen. Though a substantial amount of coal is above ground and no acute shortage would be experienced for 30 days, final settlement between operators and miners, when it is reached, is expected to raise mine costs.

THE IRON AGE composite prices for pig iron and finished steel are unchanged at \$17.84 a gross ton and 2.124c. a lb. respectively. Steel producers have eliminated a separate classification for tube rounds, now selling that product on a hot-rolled bar base.

# A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous;  
Advances Over Past Week in Heavy Type, Declines in Italics

## Pig Iron

Per Gross Ton:	Sept. 24, 1935	Sept. 17, 1935	Aug. 27, 1935	Sept. 25, 1934
No. 2 fdy., Philadelphia.....	\$20.3132	\$20.3132	\$20.3132	\$20.26
No. 2, Valley furnace.....	18.50	18.50	18.50	18.50
No. 2 Southern, Cin'tl.....	19.2007	19.2007	19.2007	19.13
No. 2, Birmingham†.....	14.50	14.50	14.50	14.50
No. 2 foundry, Chicago*.....	18.50	18.50	18.50	18.50
Basic, del'd eastern Pa.....	19.8132	19.8132	19.8132	19.76
Basic, Valley furnace.....	18.00	18.00	18.00	18.00
Malleable, Chicago.....	18.50	18.50	18.50	18.50
Malleable, Valley.....	18.50	18.50	18.50	18.50
L. S. charcoal, Chicago.....	24.2528	24.2528	24.2528	24.04
Ferromanganese, seab'd car-lots.....	85.00	85.00	85.00	85.00

†This quotation is for delivery in South; in the North prices are 38c. a ton under delivery quotations from nearest Northern furnace.

\*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

## Finished Steel

Per Lb.:	Sept. 24, 1935 Cents	Sept. 17, 1935 Cents	Aug. 27, 1935 Cents	Sept. 25, 1934 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh.....	2.40	2.40	2.40	2.40
Hot-rolled annealed sheets, No. 24, Gary.....	2.50	2.50	2.50	2.50
Sheets, galv., No. 24, P'gh..	3.10	3.10	3.10	3.10
Sheets, galv., No. 24, Gary..	3.20	3.20	3.20	3.20
Hot-rolled sheets, No. 10, P'gh	1.85	1.85	1.85	1.85
Hot-rolled sheets, No. 10, Gary	1.95	1.95	1.95	1.95
Wire nails, Pittsburgh.....	2.40	2.40	2.40	2.60
Wire nails, Chicago dist. mill	2.45	2.45	2.45	2.65
Plain wire, Pittsburgh.....	2.30	2.30	2.30	2.30
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.35
Barbed wire, galv., Pittsburgh	2.80	2.80	2.80	3.00
Barbed wire, galv., Chicago dist. mill..	2.85	2.85	2.85	3.05
Tin plate, 100 lb. box, P'gh..	\$5.25	\$5.25	\$5.25	\$5.25

## Scrap

Per Gross Ton:	Sept. 24, 1935	Sept. 17, 1935	Aug. 27, 1935	Sept. 25, 1934
Heavy melting steel, P'gh..	\$13.25	\$13.25	\$13.00	\$10.75
Heavy melting steel, Phila..	12.50	12.50	12.00	9.50
Heavy melting steel, Ch'go..	12.50	12.50	12.75	8.25
Carwheels, Chicago.....	12.75	12.75	12.75	9.50
Carwheels, Philadelphia.....	11.75	11.75	11.75	11.25
No. 1 cast, Pittsburgh.....	14.25	14.25	14.25	11.75
No. 1 cast, Philadelphia.....	11.75	11.75	11.75	11.75
No. 1 cast, Ch'go (net ton)...	11.25	11.25	11.00	8.00
No. 1 RR. wrot., Phila.....	12.25	12.25	11.75	11.25
No. 1 RR. wrot., Ch'go (net)	9.50	9.50	9.50	6.75

## Rails, Billets, etc.

Per Gross Ton:	Sept. 24, 1935	Sept. 17, 1935	Aug. 27, 1935	Sept. 25, 1934
Rails, heavy, at mill.....	\$36.37½	\$36.37½	\$36.37½	\$36.37½
Light rails, Pittsburgh.....	35.00	35.00	35.00	35.00
Rerolling billets, Pittsburgh.	27.00	27.00	27.00	27.00
Sheet bars, Pittsburgh.....	28.00	28.00	28.00	28.00
Slabs, Pittsburgh.....	27.00	27.00	27.00	27.00
Forging billets, Pittsburgh..	35.00	35.00	35.00	32.00
Wire rods, Pittsburgh.....	38.00	38.00	38.00	38.00
Skelp, grvd. steel, P'gh, lb...	1.70	1.70	1.70	1.70

## Finished Steel

Per Lb.:	Cents	Cents	Cents	Cents
Bars, Pittsburgh.....	1.80	1.80	1.80	1.80
Bars, Chicago.....	1.85	1.85	1.85	1.85
Bars, Cleveland.....	1.85	1.85	1.85	1.85
Bars, New York.....	2.15	2.15	2.15	2.13
Plates, Pittsburgh.....	1.80	1.80	1.80	1.80
Plates, Chicago.....	1.85	1.85	1.85	1.85
Plates, New York.....	2.09	2.09	2.09	2.08
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.80
Structural shapes, Chicago..	1.85	1.85	1.85	1.85
Structural shapes, New York	2.06¼	2.06¼	2.06¼	2.05¼
Cold-finished bars, Pittsburgh	1.95	1.95	1.95	2.10
Hot-rolled strips, Pittsburgh.	1.85	1.85	1.85	1.85
Cold-rolled strips, Pittsburgh	2.60	2.60	2.60	2.60

## Coke, Connellsville

Per Net Ton at Oven:	Sept. 24, 1935	Sept. 17, 1935	Aug. 27, 1935	Sept. 25, 1934
Furnace coke, prompt.....	\$3.25	\$3.25	\$3.25	\$3.85
Foundry coke, prompt.....	4.00	4.00	4.00	4.60

## Metals

Per Lb. to Large Buyers:	Sept. 24, 1935	Sept. 17, 1935	Aug. 27, 1935	Sept. 25, 1934
Electrolytic copper, refinery..	8.75	8.75	8.25	8.75
Lake copper, New York.....	9.12½	9.12½	8.62½	9.12½
Tin (Straits), New York.....	\$8.75	49.50	49.25	51.50
Zinc, East St. Louis.....	4.75	4.60	4.60	4.00
Zinc, New York.....	5.12½	4.97½	4.97½	4.35
Lead, St. Louis.....	4.35	4.20	4.20	3.50
Lead, New York.....	4.50	4.35	4.35	3.65
Antimony (Asiatic), N. Y....	13.75	13.50	13.00	8.75

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

# The Iron Age Composite Prices

## Finished Steel

Sept. 24, 1935	2.124c. a Lb.
One week ago	2.124c.
One month ago	2.124c.
One year ago	2.124c.

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.

## Pig Iron

\$17.84 a Gross Ton
17.84
17.84
17.90

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

## Steel Scrap

\$12.75 a Gross Ton
12.75
12.58
9.50

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	HIGH	LOW	HIGH	LOW	HIGH	LOW
1935 .....	2.124c., Jan. 3	2.124c., Jan. 8	\$17.90, Jan. 8	\$17.83, May 14	\$12.75, Sept. 10	\$10.33, April 23
1934 .....	2.199c., April 24	2.008c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933 .....	2.015c., Oct. 3	1.867c., April 18	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932 .....	1.977c., Oct. 4	1.926c., Feb. 2	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931 .....	2.037c., Jan. 13	1.945c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930 .....	2.273c., Jan. 7	2.018c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929 .....	2.317c., April 2	2.273c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.53, Jan. 29	14.08, Dec. 3
1928 .....	2.286c., Dec. 11	2.217c., July 17	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927 .....	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22



# Tri-State Production Maintained Except in Valleys



Pittsburgh and Wheeling District  
Rates Unchanged; Youngstown  
Average Drops to 55 Per Cent—  
Coal Strike Stops Mining Operations

**P**ITTSBURGH, Sept. 24.—Steel activity in the Tri-State district continues to follow an unusually steady course, with only minor fluctuations indicated in the past seven-day period. In the Pittsburgh area raw steel production is well maintained at 44 per cent, with a small loss in output of a large producer offset by partial resumption of open-hearth operations at a small independent mill. A two-point drop in ingot production in the Valleys and nearby northern Ohio mills, bringing the average rate down to 55 per cent of capacity, is ascribed to a lack of automobile steel orders. A flow of widely diversified orders reaching producers in the Wheeling district is sustaining raw steel production there at 80 per cent. The immediate course of steel production is believed to hinge largely upon expanding demand for automobile steel.

A pick-up in operations during the last few days of September is expected as a result of the placing of small orders anticipating increased extras or elimination of jobbing allowances on Oct. 1. Large consumers, however, have not participated in the anticipatory covering, and, for example, in the case of hot-rolled bars, orders earning the deductions for large quantities have been disappointingly few.

A temporary shadow of uncertainty has been cast upon the general outlook by the bituminous coal strike, which has paralyzed operations in the western Pennsylvania producing district. This contingency, however, is not yet regarded seriously as a threat to steel activity, since it is conceded generally that an early settlement will be effected. Only in a few instances are large consumers pressed for fuel, and most mines are well stocked with coal produced during the past several months in anticipation of a strike emergency. Hence, the supply of coal above ground is believed ample to take care of normal demand for about 30 days.

Miscellaneous steel demand continues to play a major role, but requirements from the railroads and construction fields still are depressed. No important changes are reported in finishing mill output, with tin plate holding at 55 per cent, hot-rolled strip at 40 to 45 per cent, and sheets at 70 per cent.

## Pig Iron

Small orders for spot shipment are appearing steadily, but major buying is not finding its way into the open market. Whatever major tonnage is in the market is governed largely by reciprocal arrangements between producers and mill equipment builders who are operating practically at capacity. No break in the general policy of adhering rigidly to present furnace quotations has appeared. The increased fuel costs under the Guffey bill and further cost burdens that may result from a new wage agreement, under discussion at this writing, will impart a strengthening influence to the pig iron price structure, but producers in this district foresee no early adjustments in present schedules. Fourth quarter contracting has not yet gotten under way.

## Semi-Finished Steel

The movement of sheet bars to non-integrated sheet mills probably is the best for any time this year and is tending to offset a slackening in demand from detached tin plate mills. Demand for skelp and wire rods has decreased, while interest in forging billets and slabs is widening. Few non-integrated mills are covered for extended delivery, and the steadiness of semi-finished business is sponsored chiefly by the close measurement of covering with actual consuming requirements. Prices are being well maintained.

Elimination of a separate classification for tube rounds, as set up on the Carnegie Steel Co.'s recently published card covering hot-rolled carbon bars, is being followed by other important pro-

ducers. Tube rounds now will be sold at the hot-rolled carbon bar base with certain extras applying for special requirements.

## Bolts, Nuts and Rivets

Specifications from the jobbing trade are a shade heavier, while those from other important buying groups are meager. Aggregate volume for third quarter in most instances will reflect a slight improvement over the second quarter record.

## Rails and Track Accessories

No new important inquiries have found their way into this district, and activity is rather depressed. The extension of present prices for rails and track accessories for fourth quarter delivery is forestalling interest in forward requirements.

## Reinforcing Steel

A major share of the 83,000-ton order for the Metropolitan Water District at Los Angeles is for delivery within a year. Mills in this district participating in the order have not begun to roll any of the material, and questions have arisen as to whether bending will be done on location or at the mills. State road lettings have shown a marked increase, and mill order books probably will swell noticeably in the next month, but shipping releases will be held up in many instances until next February and March, except in the South. Mill base prices are being rigidly maintained, but the distributors' price in cut lengths of 2.05c., Pittsburgh, remains vulnerable where pressure of competition is severe.

## Cold-Finished Bars

Parts makers are placing orders a little more freely, but general automotive specifications show only a minor improvement. September tonnage from the jobbing trade is in good volume, owing largely to the increased quantity extras on cold-finished carbon bars to become applicable on Oct. 1. A feature is the improved demand from machine tool equipment makers. The cold-finished industry is estimated to be operating at around 25 to 28 per cent of capacity.

## Tubular Products

Little fluctuation in aggregate weekly demand has been reported during September, and bookings of some important producers for September probably will be comparable with those in August. In the past week demand for oil country goods continued in good volume, while an increase in calls for locomotive tubes balanced a slight loss in de-

mand for mechanical tubing. Standard pipe is a little quieter. Practically no fourth quarter contracting has been done since current pipe discounts were reaffirmed for fourth quarter delivery. Pipe production in this district is maintaining a rate of 40 to 45 per cent of capacity.

#### Bars

Some small buyers are covering in anticipation of the increased size and quantity extras to apply for fourth quarter, but many of the larger consumers are buying only against actual needs. Where quantity deductions may be earned, large consumers evidently are holding off until needs become more urgent. Tonnage booked in the past week reflected little change in aggregate consumer demand. The automotive industry and possibly some non-integrated reinforcing steel makers likely will be the two major consuming groups that can take advantage of the quantity deductions provided for in the new schedule of bar prices. The 1.85c. Pittsburgh base will become generally applicable on Oct. 1.

#### Wire Products

The trend toward wide use of stamped automobile wheels for new models is adversely affecting demand for spoke wire. General specifications continue to flow in large measure from manufacturing lines, with merchant items moving to farm areas rather slowly. There is evidence of some stocking of merchant wire in anticipation of increased price schedules on Oct. 1. Orders for road mesh face substantial increase this month in line with increased lettings for State road construction, but a large share of this material will not be delivered until late winter or early spring.

#### Plates and Shapes

Inquiries for plates are few. The barge market is becoming less active in line with seasonal trends, while tank work is not adding a great deal to current activity. A fair tonnage of plates and shapes is being bid on railroad lists for fourth quarter requirements.

The structural steel market is relatively quiet. The only important award reported here in the past week was to McClintic-Marshall Corp. for 1750 tons for pier shed No. 25 at New York.

#### Sheets

Miscellaneous tonnage forged slightly ahead of automotive bookings in the past week, with aggregate volume practically unchanged. Sheet production in the current week probably will maintain a 70 per cent rate. A boon to mill schedules is a heavy demand for galvanized roofing, which is enjoying partly anticipatory coverage and a substantial demand for farm repairs.

#### Tin Plate

Specifications continue to lag, but strong operations at the leading producers' plants are holding up the general average output for the tin plate industry at around 55 per cent. Demand for "beer plate" is spreading, but tonnage requirements still are too limited to figure heavily in current producing schedules.

#### Strip Steel

Automotive tonnage has increased moderately, while a well-diversified demand from miscellaneous sources remains the backbone of the current market. Demand from jobbers is more active. Orders for stainless strip steel for automobile parts are appearing in

increasing volume. The increase in total bookings thus far has been too moderate to boost operations, and hot-rolled strip production is largely unchanged at 40 to 45 per cent of capacity. Prices are holding steadily.

#### Coal and Coke

With most mines in the western Pennsylvania area idle the first of the week, pending outcome of wage conferences at Washington, the fuel markets are practically at a standstill. The only active demand is for domestic-sized coal and coke. Little heed to the perennial strike threats is being given by consumers. A fairly substantial amount of coal is believed to be above ground, and no acute shortage would be experienced for 30 days. The probable effects of a settlement between operators and miners will be to strengthen, and possibly increase, present prices. The settlement proposed by miners would entail additional costs to producers of 10 to 12c. a ton, which, tacked on to costs of administering the Guffey act, unquestionably would force some upward revision in fuel quotations.

#### Scrap

Transactions in the past week were of minor character and had little or no effect on the general price structure. Mills in this district apparently are drawing from current supplies and will not replenish until the trend of finished steel demand for the coming quarter shapes up more definitely. In nearby districts trading is slightly more active, but not sufficiently lively to change the even course of prices. Low phosphorus specialties appear to be firmer. A lot of low phosphorous billet crops has been sold at a 50c. rise over the previous quotation.

## Weekly Indications of Steel Activity

### From THE IRON AGE

	Sept 24, 1935	Sept. 17, 1935	Aug. 27, 1935	Sept. 25, 1934	Average Year to Date	
					1935	1934
Steel ingot operations—Per cent of capacity	51.5	52.0	50.0	23.5	46.2	40.1
	Week Ended				Year to Date	
	Sept 24, 1935	Sept. 17, 1935	Aug. 27, 1935	Sept. 25, 1934	1935	1934
Fabricated structural steel awards.....	19,400	14,750	12,400	6,030	523,305	590,600
Fabricated plate awards.....	3,860	2,695	755	300	107,787	95,442
Sheet steel piling awards.....	125	0	0	0	44,240	42,800
Reinforcing bar awards.....	12,840	5,810	1,360	1,840	243,700	157,995



# Ingot Rate Dips to 59 Per Cent at Chicago



Steel Bookings, However, Are  
Fourth Largest of Year—Pig Iron  
Commitments Reach Peak for 1935  
—Scrap Is Listless

**C**HICAGO, Sept. 24.—Ingot output is off one point to 59 per cent of capacity, but sales for the week are the fourth best of the year and mill operators believe the decline in operations to be temporary and of no great significance insofar as the general drift of the market is concerned.

In view of the status of new automobile models, there is actually a satisfying flow of steel from Chicago mills to points of consumption. The agricultural equipment group shows no disposition to drop from its new peak, and miscellaneous demand all along the line and for all steel mill products is buoyant. Structural shops are entering specifications in larger volume and mills are getting their best support of the year from that source.

Jobbers of the heavy tonnage products find business active, but wire mills find only moderate increase in business from jobbers who distribute in country areas. On the other hand, there is a substantial increase in demand for manufacturers' wire.

Of particular interest in the railroad field is the announcement by the Santa Fe that it will spend a large sum for track betterment preparatory to speeding train service. Also, the Chesapeake & Ohio has authorized purchase of 21,800 tons of rails.

The scrap market is listless and dealers are inclined to believe that it will remain so during the next few weeks.

## Pig Iron

Melters are taking out full third quarter commitments and they are still anxious to put new tonnages on furnace books, which this month have grown to three and a half times the size they attained in March, which was the next best month of the current year. The Erie merchant stack is now making iron and conditions may soon be favorable for the lighting of another unit, possibly somewhere in the Middle West. Specifications

are not keeping pace with last week, but the melt is growing and sellers look for larger releases early in October.

## Reinforcing Bars

Awards total 2400 tons, including two Mississippi River dams which call for a total of 1200 tons. Low bidder has been announced on dam No. 25 which will take 400 tons of reinforcing bars. State work remains slow. Indiana, which had taken bids on 1600 tons of mesh, has decided to award grading contracts this fall and will not buy reinforcing steel until late in the winter. Small projects for stores and manufacturing plants are still in evidence and some of that tonnage is now reaching shop books. The price situation is again troublesome. Mills are holding rigidly to schedules but dealers waiver on attractive tonnages.

## Cast Iron Pipe

This week shows improvement in the number of orders, which are small and scattered. About 90 tons has been ordered out by the Sanitary District, Chicago. The near future of this market is in doubt, but sellers believe that about the time the year draws to a close many projects now being considered will have reached the stage when bids can be taken on the necessary pipe.

## Plates

Three of the major oil producers have placed a total of 2100 tons of tank work with the A. O. Smith Corp., Milwaukee. Inquiries from similar sources are light and steel sellers do not as yet see a real revival in oil country needs. The railroad equipment market remains spotty. The Santa Fe is rebuilding 150 refrigerator cars and the Norfolk & Western will build 10 hopper cars in its own shops. The United Fruit Co. has ordered a locomotive. The Ogden Canyon project in Utah, which called for 4500 tons of 36 to 48-in. pipe, is reported to have been let on the

basis of reinforced concrete construction.

## Bars

Sales of this commodity are running high, the total for the week being the third best of the year. All new gains made by the farm implement industry are being held, and Chicago bar makers report that the volume moving to automobile centers and scattered parts makers is good. Road machinery builders have excellent schedules, and the miscellaneous demand is slowly but surely growing heavier.

## Rails

The Santa Fe has announced that it will spend upward of \$3,500,000 on the betterment of its right-of-way as an advance step in the operation of faster schedules. The tonnage of rails that will be required has not been determined. Purchase authority has been granted for 21,800 tons of rails by directors of the Chesapeake & Ohio. Miscellaneous orders for rails are again very light and the track accessory movement is small.

## Wire Products

Output is firmly entrenched at 50 per cent of capacity, and indications are that it will move higher. Sales of manufacturers' wire so far in September are fully equal to the total in August, and sellers expect that by the end of this month sales will exceed the previous month's total by 25 per cent. The jobbing trade, though somewhat better, is not so heavy as producers had expected. In the first place jobbers are beginning to report conditions as somewhat spotty, and in the second place there is much grumbling among them concerning the new price set-up. Considerable trouble is being experienced along the Gulf seaboard in meeting prices asked for foreign-made products.

## Cold-Rolled Strip

Demand has receded slightly as it so often does when automobile manufacturers get first views of new designs and then delay placing their steel needs until minor changes are put through. Miscellaneous demand remains steady.

## Sheets

Chicago mills have no complaint to make about the volume of sheets that is moving to automobile centers. Releases have been steady and they are helping measurably to keep operations at a high point. Jobbers continue to take liberal quantities and miscellaneous demand is surprisingly good. Deliveries on hot-rolled sheets now range from two to three weeks and



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promises on the galvanized product average about 30 days.

### Structural Material

Both new awards and fresh inquiries are light, but releases from shops are reaching mills in good volume. Fabricators are fairly well fortified with work and can readily keep busy until such time as the various overhead crossing programs reach the contracting stage.

### Scrap

This market is in a lazy sidewise movement that gives no hint of

what the next change in trend may be. Scrap is flowing freely and some mills have reduced acceptances not because of lowered needs but because shippers were crowding unloading tracks. The Chicago Surface Lines are offering 8000 tons of rails that will go as heavy melting steel. The Milwaukee Road and Burlington are also offering lists. The railroad heavy melting steel market has not broken below \$12.95 a gross ton delivered, which indicates that prices for the heavy tonnage grades are on a solid footing.

## Reinforcing Steel

Awards 12,965 Tons—New  
 Projects 7425 Tons

### AWARDS

Millbury, Mass., 320 tons, State road and bridge, to Truscon Steel Co.

State of New York, 500 tons, bridges in St. Lawrence, Chautauqua and other counties, to a Buffalo bidder.

St. Louis, 500 tons, addition for Wagner Electric Corp., to Sheffield Steel Corp.

Denver, 250 tons, custom house, to Kalman Steel Corp.

Chicago, 165 tons, Power's store, to Calumet Steel Co.

Chicago, 714 tons, Sanitary District project No. 4, to Concrete Steel Co.

Chicago, 100 tons, Baumbach Mfg. Co., Chicago, to Calumet Steel Co.

Washington, 125 tons, sewage plant, to Taylor-Davies, Inc.

Mississippi River Dam, 600 tons, to Concrete Steel Co.

Dresbach, Minn., 600 tons, dam, to Kalman Steel Corp.

San Francisco, 500 tons, 10-story building, to Truscon Steel Co.

Ogden, Utah, 5000 tons, Ogden Canyon pipe line, award was made on reinforced concrete pipe to American Concrete & Steel Pipe Co., steel award to an unnamed bidder.

Los Angeles, 3000 tons, White Point outfall sewer, award was made on reinforced concrete pipe to American Concrete & Steel Pipe Co., steel award to an unnamed bidder.

State of Colorado, 196 tons, bridges in Arapahoe and Adams counties, to unnamed bidders.

State of Wyoming, 100 tons, bridges in four counties, to unnamed bidders.

Guadalupe County, Ariz., 117 tons, two-state bridges, to Colorado Builders Supply Co.

State of Montana, 172 tons, bridges in Toole and Madison counties, to unnamed bidders.

### NEW REINFORCING BAR PROJECTS

Columbus, Ohio, 150 tons, miscellaneous requirements for FERA.

Chicago, tonnage being estimated, warehouse for Acme Steel Co.

Mississippi River, dam No. 25, 400 tons, United Construction Co. low bidder.

State of Wisconsin, 110 tons, bridges; bids close Oct. 8.

Milwaukee, 1700 tons, clear wells and filters, for municipal water filtration plant; bids close Oct. 1.

Cap Au Gris, Mo., 558 tons, lock No. 25 in Mississippi River; United Construction Co., Winona, Minn., low bidder on general contract.

St. Louis, 125 tons, Watson Road Bridge over River Des Peres, Stiers Brothers Construction Co., St. Louis, low bidders.

Alameda County, Cal., 1100 tons, State undercrossing at Peralta Street; bids Oct. 9.

Los Angeles, 25.09 miles of 12 and 13-ft. pipe for Metropolitan Water District, Specification 115, alternates on precast or in place concrete or welded steel pipe; bids Oct. 24.

Bonneville Dam, Ore., 3400 tons, powerhouse super and substructure, and Bradford Island fish ladder; bids Oct. 8.



# Prices of Finished Steel and Iron Products

## BARS, PLATES, SHAPES

### Iron and Steel Bars

Soft Steel		Base per Lb.
F.o.b. Pittsburgh	.....	1.85c
F.o.b. Chicago	.....	1.85c
F.o.b. Gary	.....	1.85c
F.o.b. Duluth	.....	1.95c
Del'd Detroit	.....	1.95c
F.o.b. Cleveland	.....	1.95c
F.o.b. Buffalo	.....	1.95c
Del'd Philadelphia	.....	2.11c
Del'd New York	.....	2.15c
F.o.b. Birmingham	.....	1.95c
F.o.b. cars dock Gulf ports	.....	2.30c
F.o.b. cars dock Pacific ports	.....	2.35c

### Rail Steel

(For merchant trade)		
F.o.b. Pittsburgh	.....	1.75c
F.o.b. Chicago	.....	1.75c
F.o.b. Gary	.....	1.75c
F.o.b. Moline, Ill.	.....	1.75c
F.o.b. Cleveland	.....	1.75c
F.o.b. Buffalo	.....	1.85c
F.o.b. Birmingham	.....	1.85c
F.o.b. cars dock Gulf ports	.....	2.15c
F.o.b. cars dock Pacific ports	.....	2.25c

### Billet Steel Reinforcing

(Straight lengths as quoted by distributors)		
F.o.b. Pittsburgh	.....	2.05c
F.o.b. Chicago	.....	2.10c
F.o.b. Gary	.....	2.10c
Del'd Detroit	.....	2.20c
F.o.b. Cleveland	.....	2.10c
F.o.b. Youngstown	.....	2.10c
F.o.b. Buffalo	.....	2.10c
F.o.b. Birmingham	.....	2.10c
F.o.b. cars dock Gulf ports	.....	2.45c
F.o.b. cars dock Pacific ports	.....	2.45c

### Rail Steel Reinforcing

(Straight lengths as quoted by distributors)		
F.o.b. Pittsburgh	.....	1.95c
F.o.b. Chicago	.....	1.95c
F.o.b. Gary	.....	1.95c
F.o.b. Cleveland	.....	1.95c
F.o.b. Youngstown	.....	1.95c
F.o.b. Buffalo	.....	1.95c
F.o.b. Birmingham	.....	1.95c
F.o.b. cars dock Gulf ports	.....	2.30c
F.o.b. cars dock Pacific ports	.....	2.30c

### Iron

F.o.b. Chicago	.....	1.90c
F.o.b. Terre Haute, Ind.	.....	1.75c
F.o.b. Louisville, Ky.	.....	1.80c
F.o.b. Danville, Pa.	.....	1.80c
F.o.b. Berwick, Pa.	.....	1.70c

### Cold Finished Bars and Shafting\*

Base per Lb.		
F.o.b. Pittsburgh	.....	1.85c
F.o.b. Chicago	.....	1.85c
F.o.b. Gary	.....	1.85c
F.o.b. Cleveland	.....	1.95c
F.o.b. Buffalo	.....	1.95c
Del'd Detroit	.....	2.15c
Del'd eastern Michigan	.....	2.20c

\* In quantities of 10,000 to 19,000 lb.

### Fence and Sign Posts

Angle Line Posts		Base per Net Ton
F.o.b. Pittsburgh	.....	\$50.00
F.o.b. Chicago	.....	\$50.00
F.o.b. Duluth	.....	\$51.00
F.o.b. Cleveland	.....	\$50.00
F.o.b. Birmingham	.....	\$50.00
F.o.b. Houston, Orange, Beaumont, Galveston	.....	\$50.00
F.o.b. Mobile	.....	\$50.00
F.o.b. New Orleans, Lake Charles, Corpus Christi	.....	\$50.00
F.o.b. cars dock Pacific ports	.....	\$50.00

### Plates

Base per Lb.		
F.o.b. Pittsburgh	.....	1.85c
F.o.b. Chicago	.....	1.85c
F.o.b. Gary	.....	1.85c
Del'd Cleveland	.....	1.95c
F.o.b. Coatesville	.....	1.95c
F.o.b. Sparrows Point	.....	1.95c
Del'd Philadelphia	.....	1.95c
Del'd New York	.....	2.25c
F.o.b. Birmingham	.....	1.95c
F.o.b. cars dock Gulf ports	.....	2.35c
F.o.b. cars dock Pacific ports	.....	2.35c
Wrought iron plates, f.o.b. P'gh.	.....	2.30c

### Floor Plates

F.o.b. Pittsburgh	.....	3.35c
F.o.b. Chicago	.....	3.40c
F.o.b. Coatesville	.....	3.45c
F.o.b. cars dock Gulf ports	.....	3.75c
F.o.b. cars dock Pacific ports	.....	3.90c

### Structural Shapes

Base per Lb.		
F.o.b. Pittsburgh	.....	1.85c
F.o.b. Chicago	.....	1.85c
Del'd Cleveland	.....	1.95c
F.o.b. Buffalo	.....	1.95c
F.o.b. Bethlehem	.....	1.95c
Del'd Philadelphia	.....	2.015c
Del'd New York	.....	2.025c
F.o.b. Birmingham (standard)	.....	1.95c
F.o.b. cars dock Gulf ports	.....	2.30c
F.o.b. cars dock Pacific ports	.....	2.35c

## Steel Sheet Piling

Base per Lb.		
F.o.b. Pittsburgh	.....	2.15c
F.o.b. Chicago	.....	2.25c
F.o.b. Buffalo	.....	2.25c
F.o.b. cars dock Gulf ports	.....	2.60c
F.o.b. cars dock Pacific ports	.....	2.60c

## SHEETS, STRIP, TIN PLATE

Hot Rolled		Base per Lb.
No. 10, f.o.b. Pittsburgh	.....	1.85c
No. 10, f.o.b. Gary	.....	1.95c
No. 10, del'd Detroit	.....	2.05c
No. 10, del'd Phila.	.....	2.10c
No. 10, f.o.b. Birmingham	.....	2.00c
No. 10, f.o.b. cars dock Pacific ports	.....	2.40c

### Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	.....	2.40c
No. 24, f.o.b. Gary	.....	2.50c
No. 24, del'd Detroit	.....	2.60c
No. 24, del'd Phila.	.....	2.71c
No. 24, f.o.b. Birmingham	.....	2.55c
No. 24, f.o.b. cars dock Pacific ports	.....	3.05c
No. 24, wrought iron, Pittsburgh	.....	4.30c

### Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	.....	2.50c
No. 10 gage, f.o.b. Gary	.....	2.60c
No. 10 gage, del'd Detroit	.....	2.70c
No. 10 gage, del'd Phila.	.....	2.81c
No. 10 gage, f.o.b. Birmingham	.....	2.65c
No. 10 gage, f.o.b. cars dock Pacific ports	.....	3.10c

### Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	.....	2.95c
No. 20 gage, f.o.b. Gary	.....	3.05c
No. 20 gage, del'd Detroit	.....	3.15c
No. 20 gage, del'd Phila.	.....	3.26c
No. 20 gage, f.o.b. Birmingham	.....	3.10c
No. 20, f.o.b. cars dock Pacific ports	.....	3.50c

### Galvanized Sheets

No. 24 gage, f.o.b. Pittsburgh	.....	3.10c
No. 24, f.o.b. Gary	.....	3.20c
No. 24, del'd Phila.	.....	3.41c
No. 24, f.o.b. Birmingham	.....	3.25c
No. 24, f.o.b. cars dock Pacific ports	.....	3.70c
No. 24, wrought iron, Pittsburgh	.....	4.95c

### Long Ternes

No. 24, unassorted 8-lb. coating	.....	3.40c
F.o.b. Pittsburgh	.....	3.50c
F.o.b. cars dock Pacific ports	.....	4.10c

### Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	.....	3.10c
No. 20, f.o.b. Gary	.....	3.20c
No. 20, f.o.b. Birmingham	.....	3.70c
No. 20, f.o.b. cars dock Pacific ports	.....	3.70c
No. 10, f.o.b. Gary	.....	2.90c
No. 10, f.o.b. Birmingham	.....	2.60c
No. 10, f.o.b. cars dock Pacific ports	.....	3.10c

### Tin Mill Black Plates

No. 28, f.o.b. Pittsburgh	.....	2.75c
No. 28, Gary	.....	2.85c
No. 28, cars dock Pacific Coast	.....	3.35c

### Tin Plate

Per Base Box		
Standard cokes, f.o.b. P'gh district mill	.....	\$5.25
Standard cokes, f.o.b. Gary	.....	5.35
Standard cokes, f.o.b. cars dock Pacific ports	.....	5.90

### Tern Plate

(F.o.b. Pittsburgh)		
8-lb. coating I.C.	.....	\$10.00
15-lb. coating I.C.	.....	12.00
20-lb. coating I.C.	.....	13.00
25-lb. coating I.C.	.....	14.00
30-lb. coating I.C.	.....	15.25
40-lb. coating I.C.	.....	17.50

### Hot-Rolled Hoops, Bands, Strips and Flats under 1/4 in.

Base per Lb.		
All widths up to 24 in., P'gh	.....	1.85c
All widths up to 24 in., Chicago	.....	1.95c
All widths up to 24 in., del'd Detroit	.....	2.05c
All widths up to 24 in., Birmingham	.....	2.00c
Cooperage stock, Pittsburgh	.....	1.95c
Cooperage stock, Chicago	.....	2.05c

### Cold-Rolled Strips

Base per Lb.		
F.o.b. Pittsburgh	.....	2.60c
F.o.b. Cleveland	.....	2.60c
Del'd Chicago	.....	2.95c
F.o.b. Worcester	.....	2.95c

### Fender Stock

No. 14, Pittsburgh or Cleveland	.....	2.90c
No. 14, Worcester	.....	3.20c
No. 20, Pittsburgh or Cleveland	.....	2.30c
No. 20, Worcester	.....	3.70c

## Hot-Rolled Rail Steel Strips

Base per Lb.		
F.o.b. Pittsburgh	.....	1.70c
F.o.b. Chicago	.....	1.75c
F.o.b. Birmingham	.....	1.85c

## WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade		Per Lb.
Light wire	.....	2.30c
Spring wire	.....	2.90c
Chicago prices on products sold to the manufacturing trade are \$1 a ton above Pittsburgh or Cleveland. Worcester and Duluth prices are \$2 a ton above, Birmingham \$3 above, and Pacific Coast prices \$9 a ton above Pittsburgh or Cleveland.		

### To Large-Lot Buyers

Base per Keg		
Standard wire nails	.....	\$2.40
Smooth coated nails	.....	2.40

### Base per 100 Lb.

Annealed fence wire	.....	\$2.45
Galvanized fence wire	.....	3.10
Polished staples	.....	3.35
Barbed wire, galvanized	.....	2.80
Twisted barless wire	.....	2.80
Woven wire fence, base column	.....	\$3.00
Single knip bale ties, base column	.....	\$3.00

Chicago and Anderson, Ind., mill prices are \$1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is \$2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are \$2 a ton over Pittsburgh (except for woven wire fence at Duluth, which is \$3 over Pittsburgh), and Birmingham mill prices are \$3 a ton over Pittsburgh.

On wire nails, barbed wire, staples and fence wire, prices at Houston, Galveston and Corpus Christi, Tex., New Orleans, Lake Charles, La., and Mobile, Ala., are \$6 a ton over Pittsburgh, while Pacific Coast prices are \$8 over Pittsburgh. Exception: on fence wire Pacific Coast prices are \$11 a ton above Pittsburgh.

On staples and barbed wire, prices of \$6 a ton above Pittsburgh are also quoted at Beaumont and Orange, Tex.

## Wire Hoops, Twisted or Welded

Off List		
F.o.b. Pittsburgh	.....	35 and 2 1/2 off
F.o.b. Chicago	.....	35 off

## STEEL AND WROUGHT PIPE AND TUBING

### Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills  
F.o.b. Pittsburgh only on wrought iron pipe.

### Butt Weld

Steel		Inches Black Galv.	Wrought Iron
1/4	.....	31 1/2	31 1/2
3/8	.....	35	35
1/2	.....	37 1/2	37 1/2
3/4	.....	41	41
1	.....	45	45
1 1/4	.....	51	51
1 1/2	.....	55	55
2	.....	61 1/2	61 1/2
2 1/2	.....	67 1/2	67 1/2
3	.....	73 1/2	73 1/2
3 1/2	.....	79 1/2	79 1/2
4	.....	85 1/2	85 1/2
4 1/2	.....	91 1/2	91 1/2
5	.....	97 1/2	97 1/2
5 1/2	.....	103 1/2	103 1/2
6	.....	109 1/2	109 1/2
6 1/2	.....	115 1/2	115 1/2
7	.....	121 1/2	121 1/2
7 1/2	.....	127 1/2	127 1/2
8	.....	133 1/2	133 1/2
8 1/2	.....	139 1/2	139 1/2
9	.....	145 1/2	145 1/2
9 1/2	.....	151 1/2	151 1/2
10	.....	157 1/2	157 1/2
10 1/2	.....	163 1/2	163 1/2
11	.....	169 1/2	169 1/2
11 1/2	.....	175 1/2	175 1/2
12	.....	181 1/2	181 1/2
12 1/2	.....	187 1/2	187 1/2
13	.....	193 1/2	193 1/2
13 1/2	.....	199 1/2	199 1/2
14	.....	205 1/2	205 1/2
14 1/2	.....	211 1/2	211 1/2
15	.....	217 1/2	217 1/2
15 1/2	.....	223 1/2	223 1/2
16	.....	229 1/2	229 1/2
16 1/2	.....	235 1/2	235 1/2
17	.....	241 1/2	241 1/2
17 1/2	.....	247 1/2	247 1/2
18	.....	253 1/2	253 1/2
18 1/2	.....	259 1/2	259 1/2
19	.....	265 1/2	265 1/2
19 1/2	.....	271 1/2	271 1/2
20	.....	277 1/2	277 1/2
20 1/2	.....	283 1/2	283 1/2
21	.....	289 1/2	289 1/2
21 1/2	.....	295 1/2	295 1/2
22	.....	301 1/2	301 1/2
22 1/2	.....	307 1/2	307 1/2
23	.....	313 1/2	313 1/2
23 1/2	.....	319 1/2	319 1/2
24	.....	325 1/2	325 1/2
24 1/2	.....	331 1/2	331 1/2
25	.....	337 1/2	337 1/2
25 1/2	.....	343 1/2	343 1/2
26	.....	349 1/2	349 1/2
26 1/2	.....	355 1/2	355 1/2
27	.....	361 1/2	361 1/2

## BOLTS, NUTS, RIVETS AND SET SCREWS

**Bolts and Nuts**  
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine bolts	75
Carriage bolts	75
Lag bolts	75
Flange bolts, Nos. 1, 2, 3 and 7 heads	75
Hot-pressed nuts, blank or tapped, square	75
Hot-pressed nuts, blank or tapped, hexagon	75
Hot-pressed and square or hex. nuts, blank or tapped	75
Semi-finished hexagon nuts, U.S.S. and S.A.E., all sizes to and incl.	75
1 in. diameter	75
Larger than 1 in. diameter	75
Store bolts in packages, Pittsburgh	75
Store bolts in packages, Chicago	75
Store bolts in packages, Cleveland	75
Store bolts in bulk, Pittsburgh	83
Store bolts in bulk, Chicago	83
Store bolts in bulk, Cleveland	83
Tire bolts	60

**Large Rivets**  
(1/2 in. and larger)

F.o.b. Pittsburgh or Cleveland	\$2.90
F.o.b. Chicago	3.00
F.o.b. Birmingham	3.05

**Small Rivets**  
(7/16 in. and smaller)

F.o.b. Pittsburgh	70 and 5
F.o.b. Cleveland	70 and 5
F.o.b. Chicago and Birm'g'm	70 and 5

**Cap and Set Screws**  
(Freight allowed up to but not exceeding 65c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws, 1 in. dia. and smaller	80, 10 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller	75
Milled headless set screws, cut thread	75
1/2 in. and smaller	75
Upset hex. head cap screws, U.S.S. or S.A.E. thread, 1 in. dia. and smaller	85
Upset set screws, cut and oval points	75 and 10
Milled studs	65 to 65 and 10

## Alloy and Stainless Steel

**Alloy Steel Ingots**  
(F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, Uncropped)

**Alloy Steel Blooms, Billets and Slabs**  
(F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, Base price, \$49 a gross ton)

	Per Cent Off List
Price del'd Detroit is \$52.	
F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton	
Open-hearth grade, base	2.45c.
Delivered price at Detroit is	2.60c.
S.A.E. Alloy Series	
Numbers	Differential per 100 lb.
2000 (1/2% Nickel)	0.25
2100 (2 1/2% Nickel)	0.55
2300 (3 1/2% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.20
6100 Chromium Vanadium Spring Steel	0.70
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars 1/2c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2 1/2 in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

**Alloy Cold-Finished Bars**  
(F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo. 2.95c. base per lb.)

**STAINLESS STEEL No. 302**  
(17 to 19% Cr. 7 to 9% Ni. 0.08 to 0.20% C.)  
(Base Prices f.o.b. Pittsburgh)

Forging billets	19.55c.
Hot-rolled slabs	15c.
Bars	23c.
Plates	26c.
Structural shapes	23c.
Sheets	35c.
Hot-rolled strip	30 1/2c.
Cold-rolled strip	27c.
Drawn wire	25c.

## Raw and Semi-Finished Steel

### Carbon Steel Rolling Ingots

(F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Uncropped) \$29 per gross ton

### Carbon Steel Forging Ingots

(F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Uncropped) \$31 per gross ton

### Billets, Blooms and Slabs

(F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Uncropped) \$27.00 per gross ton

Forging quality \$35.00

### Delivered Detroit

Rolling \$30.00  
Forging \$38.00

### Billets Only F.o.b. Duluth

Rolling \$29.00  
Forging \$37.00

### Sheet Bars

(F.o.b. Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.)

Open-hearth or Bessemer \$28.00

### Skelp

(F.o.b. Pittsburgh, Chicago, Youngstown, Buffalo, Coatesville, Pa., Sparrows Point, Md.)

Grooved 1.70c.  
Universal 1.70c.  
Sheared 1.70c.

### Wire Rods

(Common, base)

	Per Gross Ton
F.o.b. Pittsburgh	\$38.00
F.o.b. Cleveland	38.00
F.o.b. Chicago	39.00
F.o.b. Anderson, Ind.	39.00
F.o.b. Youngstown	39.00
F.o.b. Worcester, Mass.	40.00
F.o.b. Birmingham	41.00
F.o.b. San Francisco	47.00
F.o.b. Galveston	44.00

## Pig Iron and Ferroalloys

### PIG IRON

#### PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	\$19.50	\$20.00	\$19.00	\$20.50
Bethlehem, Pa.	19.50	20.00	19.00	20.50
Birdsboro, Pa.	19.50	20.00	19.00	20.50
Swedeland, Pa.	19.50	20.00	19.00	20.50
Steelton, Pa.	19.50	20.00	19.00	20.50
Sparrows Point, Md.	19.50	20.00	19.00	20.50
Neville Island, Pa.	18.50	18.50	18.00	19.00
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Youngstown	18.50	18.50	18.00	19.00
Buffalo	18.50	19.00	17.50	19.50
Erie, Pa.	18.50	19.00	18.00	19.00
Cleveland	18.50	18.50	18.00	19.00
Toledo, Ohio	18.50	18.50	18.00	19.00
Jackson, Ohio	20.25	20.25	19.75	20.75
Detroit	18.50	18.50	18.00	19.00
Hamilton, Ohio	18.50	18.50	18.00	19.00
Chicago	18.50	18.50	18.00	19.00
Granite City, Ill.	18.50	18.50	18.00	19.00
Duluth, Minn.	19.00	19.00	19.50	19.50
Birmingham	14.50	14.50	13.50	19.00
Provo, Utah	17.50		17.00	

#### DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District	\$20.00	\$20.50	\$19.50	\$21.00
From Everett, Mass.				
Brooklyn	21.9289	22.4289	21.9289	22.9289
Newark or Jersey City, N. J.	20.9873	21.4873	20.4873	21.9873
From East. Pa.				
Philadelphia	20.3132	20.8132	19.8132	21.3132
From Eastern Pa.				
Cincinnati	19.5807	19.5807	19.0807	20.0807
From Hamilton, Ohio				
Canton, Ohio	19.8402	19.8402	19.3402	20.3402
From Cleveland and Youngstown				
Columbus, Ohio	20.64	20.64		
From Hamilton, Ohio				
Mansfield, Ohio	20.3832	20.3832		
From Cleveland and Toledo				
Indianapolis	20.9289	20.9289		
From Hamilton, Ohio				
South Bend, Ind.	20.6935	20.6935		
From Chicago				
Milwaukee	19.57	19.57		
From Chicago				
St. Paul	20.94			
From Duluth				
Davenport, Iowa	20.3832	20.3832		
From Chicago				
Kansas City	21.2178	21.2178		
From Granite City				
San Francisco, Los Angeles or Seattle	22.315			
From Provo				

Delivered prices on Southern iron for shipment to Northern points are 88c. a gross ton below delivered prices from the nearest Northern basing points.

### LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y. \$23.50

### GRAY FORGE PIG IRON

Valley furnace \$18.00  
Pittsburgh district furnace \$18.00

### CHARCOAL PIG IRON

Lake Superior furnace \$21.00

Delivered Chicago \$24.2528

Delivered Buffalo \$24.595

## CANADA

### Pig Iron

Per gross ton:

Delivered Toronto  
No. 1 fdy., sil. 2.25 to 2.75 \$21.00  
No. 2 fdy., sil. 1.75 to 2.75 20.50  
Malleable 21.00

Delivered Montreal  
No. 1 fdy., sil. 2.25 to 2.75 \$22.50  
No. 2 fdy., sil. 1.75 to 2.25 22.00  
Malleable 22.50  
Basic 22.00

## FERROALLOYS

### Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.  
Domestic, 80% (carload) \$35.00

### Spiegeleisen

Per Gross Ton Furnace  
Domestic, 19 to 21% \$26.00  
50-ton lots 3-mo. shipment 24.00  
F.o.b. New Orleans 26.00

### Electric Ferrosilicon

Per Gross Ton Delivered  
50% (carloads) \$77.50  
50% (ton lots) 85.00  
75% (carloads) 138.00  
75% (ton lots) 138.00

### Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton	Per Gross Ton
0% \$22.75	12% \$29.25
7% 23.75	13% 30.75
8% 24.75	14% 32.25
9% 25.75	15% 33.75
10% 26.75	16% 35.25
11% 27.75	17% 36.75

The lower all-rail delivered prices from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are \$1.25 a ton higher than at Jackson.  
Manganese 2 to 3%, \$1 a ton additional.  
For each unit of manganese over 3%, \$1 a ton additional.

### Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton	Per Gross Ton
10% \$27.75	14% \$33.25
11% 28.75	15% 34.75
12% 29.75	16% 36.25
13% 30.75	17% 37.75

Manganese 2 to 3%, \$1 a ton additional.  
For each unit of manganese over 3%, \$1 a ton additional.  
Base prices at Buffalo are \$1.25 a ton higher than at Jackson.

### Other Ferroalloys

Ferrotungsten, per lb. contained W. del., carloads \$1.35 to \$1.45  
Ferrotungsten, less carloads 1.45 to 1.55  
Ferromanganese, 4 to 6% carbon and up, 35 to 70% Cr. per lb. contained Cr. delivered, in carloads 10.00c.  
Ferromanganese, 2% carbon 18.50c. to 17.00c.  
Ferromanganese, 1% carbon 17.50c. to 18.00c.  
Ferromanganese, 0.10% carbon 19.50c. to 20.00c.  
Ferromanganese, 0.06% carbon 20.00c. to 20.50c.  
Ferrovanadium, del. per lb. contained V. \$2.70 to \$2.90  
Ferrocarborantitanium, 15 to 18% Ti, 6 to 8% C. f.o.b. furnace carload and contract per net ton \$137.50  
Ferrophosphorus, electric, or blast furnace material, in carloads, 18% Hootdale, Tenn., base, per gross ton with \$2 unitage 50.00  
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton with \$2.75 unitage 65.00  
Ferromolybdenum, per lb. Mo., del. 95c.  
Calcium molybdate, per lb. Mo., del. 80c.  
Silico spiegel, per ton, f.o.b. furnace, carloads \$38.00  
Ton lots or less, per ton 45.50  
Silico-manganese, gross ton, delivered 2.50% carbon grade 90.00  
2% carbon grade 95.00  
1% carbon grade 103.00  
Spot prices \$3 a ton higher



# Iron and Steel Scrap

## PITTSBURGH

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$13.00 to \$13.50
No. 2 heavy melting steel	12.00 to 12.50
No. 3 railroad wrought	13.50 to 14.00
Scrap rails	14.25 to 14.75
Rails, 3 ft. and under	15.00 to 15.50
Compressed sheet steel	13.00 to 13.50
Hand bundled sheet steel	12.00 to 12.50
Hvy. steel axle turnings	11.50 to 12.00
Machine shop turnings	9.50 to 10.00
Short shov. turnings	9.50 to 10.00
Short mixed borings and turnings	7.00 to 7.50
Cast iron borings	7.00 to 7.50
Cast iron carwheels	14.00 to 14.50
Heavy breakable cast	12.25 to 12.75
No. 1 cast	14.00 to 14.50
Railr. knuckles and couplers	15.00 to 15.50
Rail. coil and leaf springs	15.50 to 16.00
Roller steel wheels	15.50 to 16.00
Low phos. billet crops	16.50 to 17.00
Low phos. sheet bar crops	15.50 to 16.00
Low phos. punchings	15.00 to 15.50
Low phos. plate scrap	14.50 to 15.00
Steel car axles	14.50 to 15.00

## CHICAGO

Delivered Chicago district consumers:	
Per Gross Ton	
Heavy melting steel	\$12.25 to \$12.75
Automobile hvy. melt. steel	11.25 to 11.75
Shoveling steel	12.25 to 12.75
Hydraulic comp. sheets	11.25 to 11.75
Drop forge flashings	9.50 to 10.00
No. 1 busheling	11.00 to 11.50
Roller carwheels	12.75 to 13.25
Railroad tires	13.00 to 13.50
Railroad leaf springs	13.75 to 14.25
Steel turnings	11.00 to 11.50
Steel couplers and knuckles	13.25 to 13.75
Coil springs	14.25 to 14.75
Steel turnings (elec. fur.)	11.75 to 12.25
Low phos. punchings	14.50 to 15.00
Low phos. plates, 12 in. and under	14.50 to 15.00
Cast iron borings	8.00 to 8.50
Short shoveling turnings	7.50 to 8.00
Machine shop turnings	7.00 to 7.50
Berolling rails	13.50 to 14.00
Steel rails, less than 3 ft.	13.50 to 14.00
Steel rails, less than 3 ft.	15.00 to 15.50
Angle bars, steel	14.00 to 14.50
Cast iron carwheels	12.75 to 13.25
Railroad malleable	14.75 to 15.25
Agricultural malleable	16.25 to 16.75

## PHILADELPHIA

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$12.50
No. 2 heavy melting steel	\$11.25 to \$11.50
Hydraulic compressed, new	10.00 to 10.50
Hydraulic compressed, old	8.50 to 9.00
Steel rails for rolling	14.00 to 14.50
Cast iron carwheels	11.50 to 12.00
Heavy breakable cast	11.00 to 11.50
No. 1 cast	11.50 to 12.00
Stove plate (steel works)	9.00 to 9.50
Machine shop turnings	7.00 to 7.50
No. 1 blast furnace	8.00 to 8.50
Heavy axle turnings	9.50 to 10.00
Cast borings	5.00 to 5.50
No. 1 low phos. heavy	14.50 to 15.00
Couplers and knuckles	14.00 to 14.50
Roller steel wheels	14.00 to 14.50
Steel axles	16.00
Shafting	17.50 to 18.00
No. 1 railroad wrought	12.00 to 12.50
Spec. iron and steel pipe	9.50 to 10.00
Bundled sheets	9.50 to 10.00
No. 1 forge fire	9.50 to 10.00
Cast borings (chem.)	10.50 to 11.00

## CINCINNATI

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	\$9.00 to \$9.50
No. 2 heavy melting steel	7.50 to 8.00
Scrap rails for melting	8.75 to 9.25
Loose sheet scrapings	8.00 to 8.50
Bundled sheets	6.75 to 7.25
Cast iron borings	5.00 to 5.50
Machine shop turnings	5.25 to 5.75
No. 1 busheling	6.75 to 7.25
No. 2 busheling	3.25 to 3.75
Rails for rolling	9.75 to 10.25
No. 1 locomotive tires	8.00 to 8.50
Short rails	12.50 to 13.00
Cast iron carwheels	9.00 to 9.50
No. 1 machinery cast	10.00 to 10.50
No. 1 railroad cast	9.25 to 9.75
Burnt cast	6.75 to 7.25
Stove plate	6.75 to 7.25
Agricultural malleable	8.75 to 9.25
Railroad malleable	10.00 to 10.50

## CLEVELAND

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$12.25 to \$12.50
No. 2 heavy melting steel	11.25 to 11.50
Compressed sheet steel	11.00 to 11.50
Light bundled sheet stampings	9.25 to 9.75
Drop forge flashings	10.50 to 11.00
Machine shop turnings	7.75 to 8.25
Short shoveling turnings	8.00 to 8.50
No. 1 busheling	10.50 to 11.00
Steel axle turnings	10.50 to 11.00
Low phos. billet crops	15.00 to 15.50
Cast iron borings	7.75 to 8.25
Mixed borings and short turnings	7.75 to 8.25
No. 2 busheling	7.75 to 8.25
No. 1 cast	13.50 to 14.00
Railroad grate bars	7.00 to 7.50
Stove plate	7.50 to 8.00
Rails under 3 ft.	13.00 to 13.50
Rails for rolling	15.50 to 16.00
Railroad malleable	15.50 to 16.00
Cast iron carwheels	10.75 to 11.00

## BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:	
No. 1 heavy melting steel	\$12.00 to \$12.50
No. 2 heavy melting scrap	10.50 to 11.00
Scrap rails	12.00 to 12.50
New hydraulic comp. sheets	10.50 to 11.00
Old hydraulic comp. sheets	9.50 to 10.00
Drop forge flashings	10.50 to 11.00
No. 1 busheling	10.50 to 11.00
Hvy. steel axle turnings	10.50 to 11.00
Machine shop turnings	5.50 to 6.00
Knuckles and couplers	13.00 to 14.00
Coil and leaf springs	13.00 to 14.00
Roller steel wheels	13.00 to 14.00
Low phos. billet crops	14.50 to 15.00
Short shov. steel turnings	7.50 to 8.00
Short mixed borings and turnings	7.50 to 8.00
Cast iron borings	7.50 to 8.00
No. 2 busheling	7.00 to 7.50
Steel car axles	12.50 to 13.00
Iron axles	12.50 to 13.00
No. 1 machinery cast	12.50 to 13.00
No. 1 cupola cast	11.50 to 12.00
Stove plate	10.00 to 10.50
No. 2 steel, 3 ft. and under	14.50 to 15.00
Cast iron carwheels	12.00 to 12.50
Railroad malleable	13.50 to 14.00
Chemical borings	9.00 to 9.50

## BOSTON

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	\$9.75
No. 1 heavy melting steel	\$7.40 to \$7.90
Scrap rails	7.50 to 8.00
No. 2 steel	8.40 to 8.90
Breakable cast	6.00 to 6.25
Machine shop turnings	3.65
"Machine shop turnings"	4.50 to 5.00
Bundled skeleton, long	6.00 to 6.15
Forge flashings	6.00 to 6.40
Shafting	12.00 to 12.50
Steel car axles	12.00 to 12.25
Cast iron borings, chemical	5.00 to 7.00

\* Delivered local army base.

## NEW YORK

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	\$8.50 to \$8.75*
No. 2 heavy melting steel	7.50 to 7.75*
Heavy breakable cast	6.75 to 7.25
No. 1 machinery cast	7.00 to 7.50
No. 2 cast	6.50
Stove plate	13.50 to 14.00
Steel car axles	13.50 to 14.00
Shafting	13.50 to 13.75
No. 1 railroad wrought	7.75 to 8.25
No. 1 yard wrought, long	6.75 to 7.25
Spec. iron and steel pipe	5.50 to 6.00
Forge fire	6.50 to 7.00
Rails for rolling	9.00 to 10.00
Short shoveling turnings	3.00 to 3.25
Machine shop turnings	3.50 to 4.00
Cast borings	3.50 to 3.75
No. 1 blast furnace	2.00 to 2.50
Cast borings (chemical)	11.00 to 11.50
Unprepared yard iron and steel	4.50 to 5.00

Per gross ton, delivered local foundries:	
No. 1 machinery cast	\$10.50
No. 1 hvy. cast (cupola size)	9.50
No. 2 cast	8.00

\* Loading on barge.  
\*25c. higher offered at nearby New Jersey points.

## BIRMINGHAM

Per gross ton delivered consumers' yards:	
Heavy melting steel	\$7.50 to \$8.00
Scrap steel rails	10.00 to 10.50
Short shoveling turnings	7.00
Stove plates	7.00
Steel axles	11.50
Iron axles	11.50
No. 1 railroad wrought	7.00
Rails for rolling	12.50
No. 1 cast	10.00 to 10.50
Tramcar wheels	10.00

## ST. LOUIS

Per gross ton delivered consumers' yards:	
Selected heavy steel	\$9.25 to \$9.75
No. 1 heavy melting	8.75 to 9.25
No. 2 heavy melting	8.00 to 8.50
No. 1 locomotive tires	9.75 to 10.25
Misc. stand-sec. rails	11.00 to 11.50
Railroad springs	12.00 to 12.50
Bundled sheets	6.00 to 6.50
No. 2 railroad wrought	9.25 to 9.75
No. 1 busheling	5.00 to 5.50
Cast iron borings and shoveling turnings	3.00 to 3.50
Rails for rolling	11.50 to 12.00
Machine shop turnings	2.75 to 3.25
Heavy turnings	5.50 to 6.00
Steel car axles	12.50 to 13.00
Iron car axles	15.00 to 16.00
No. 1 railroad wrought	7.00 to 7.50
Steel rails less than 3 ft.	13.00 to 13.50
Steel angle bars	12.00 to 12.50
Cast iron carwheels	9.00 to 9.50
No. 1 machinery cast	9.50 to 10.00
Railroad malleable	12.50 to 13.00
No. 1 railroad cast	9.00 to 9.50
Stove plate	6.50 to 7.00
Agricult. malleable	8.50 to 9.00

## DETROIT

Dealers' buying prices per gross ton:	
Heavy melting steel	\$9.50 to \$10.00
Borings and short turnings	5.75 to 6.25

## ORES, FLUORSPAR, COKE, FUEL, REFRACTORIES

### Lake Superior Ores

Delivered Lower Lake Ports	
Per Gross Ton	
Old range, Bessemer, 51.50% iron	\$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi, Bessemer, 51.50% iron	4.65
Mesabi, non-Bessemer, 51.50% iron	.50
High phosphorus, 51.50% iron	4.40

### Foreign Ore

U.S.I. Philadelphia or Baltimore	
Per Unit	
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algeria	10.50c.
Iron, low phos., Swedish, average 68% iron	10.50c.
Iron, basic or foundry, Swedish, aver. 65% iron	9.50c.
Iron, basic or foundry, Russian, aver. 65% iron	9.50c.
Manganese, Caucasian, washed 82% 48%	23c.
Manganese, African, Indian, 44-48%	24c.
Manganese, Brazilian, 46 to 48% 51%	20c.

Per Net Ton Unit	
Tungsten, Chinese, wolframite, duty paid, delivered	\$15.50 to \$16.00
Tungsten, domestic, scheelite, delivered	15.00

Per Gross Ton	
Chrome, 45% Cr <sub>2</sub> O <sub>3</sub> , lump, c.l.f. Atlantic Seaboard (African)...	\$17.50
45 to 48% Cr <sub>2</sub> O <sub>3</sub> (Turkish)...	\$16.00 to 16.50
48% Cr <sub>2</sub> O <sub>3</sub> (African)...	20.50
48% min. Cr <sub>2</sub> O <sub>3</sub> (Turkish)...	19.25
Chrome concentrate, 50% and over Cr <sub>2</sub> O <sub>3</sub> , c.l.f. Atlantic Seaboard.	22.00
52% Cr <sub>2</sub> O <sub>3</sub> (Turkish) .....	21.75
48 to 48% Cr <sub>2</sub> O <sub>3</sub> (Turkish)....	19.25

### Fluorspar

Per Net Ton	
Domestic, washed gravel, 85-5, f.o.b. Kentucky and Illinois mines for all-rail shipment	\$14.00 to \$15.00
Same grade for Ohio River barge shipment for Kentucky and Illinois River landings	14.00 to 15.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	14.00 to 15.00
Foreign, 95% calcium fluoride, not over 5% silicon, c.l.f. Atlantic ports, duty paid	18.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2% silicon, f.o.b. Illinois and Kentucky mines	30.00

## COKE, COAL AND FUEL OIL

Coke	
Per Net Ton	
Furnace, f.o.b. Connelville	\$3.25 to \$3.50
Prompt, f.o.b. Connelville	6.00 to 6.10
Foundry, by-product, Chicago ovens, for delivery outside switching district	8.50
Foundry, by-product, delivered in Chicago switching district	9.25
Foundry, by-product, New England, delivered	11.00
Foundry, by-product, Newark or Jersey City, del'd	9.24 to 9.72
Foundry, by-product, Phila.	9.02
Foundry, by-product, Cleveland, delivered	9.25
Foundry, Birmingham	6.00

Long turnings	\$5.50 to \$6.00
No. 1 machinery cast	12.25 to 12.75
Automotive cast	12.75 to 13.25
Hydraulic comp. sheets	10.00 to 10.50
Stove plate	7.75 to 8.25
New factory busheling	5.75 to 6.25
Old No. 2 busheling	5.25 to 5.75
Sheet clippings	6.75 to 7.25
Flashings	8.50 to 9.00
Low phos. plate scrap	10.00 to 10.50

## CANADA

Dealers' buying prices per gross ton:	
Toronto Montreal	
Heavy melting steel	\$7.00 \$7.00
Rails scrap	8.00 8.00
Machine shop turnings	3.00 3.00
Boiler plate	4.50 4.50
Heavy axle turnings	4.50 4.00
Cast borings	4.00 3.50
Steel borings	2.00 2.00
Wrought pipe	3.50 3.50
Steel axles	7.00 8.00
Axles, wrought iron	7.00 8.00
No. 1 machinery cast	9.00 9.00
Stove plate	5.50 5.00
Standard carwheels	7.25 7.00
Malleable	6.75 7.00

Foundry, by-product, St. Louis, f.o.b. ovens, del'd	
Foundry, by-product, del'd St. Louis	9.00
Foundry, from Birmingham, f.o.b. cars docks, Pacific ports	14.75

### Coal

Per Net Ton	
Mine run steam coal, f.o.b. W. Pa. mines	\$1.45 to \$1.60
Mine run coking coal, f.o.b. W. Pa.	1.75 to 1.90
Gas coal, 1/2-in., f.o.b. Pa. mines	1.25 to 1.35
Mine run gas coal, f.o.b. Pa. mines	1.75 to 1.90
Steam slack, f.o.b. W. Pa. mines	1.00 to 1.25
Gas slack, f.o.b. W. Pa. mines	1.25 to 1.45

### Fuel Oil

Per Gal. f.o.b. Bessemer, N. J.	
No. 3 distillate	4.25c.
No. 4 industrial	3.97 1/2c.

## REFRACTORIES

### Fire Clay Brick

Per 1000 f.o.b. Works	
High-heat Intermediate Duty Brick	
Pennsylvania	\$45.00
Maryland	5.00
New Jersey	50.00
Ohio	48.00
Kentucky	45.00
Missouri	45.00
Illinois	45.00
Ground fire clay, per ton	7.00

### Silica Brick

Per 1000 f.o.b. Works	
Pennsylvania	\$45.00
Chicago District	54.00
Birmingham	55.00
Silica clay, per net ton	8.00

### Chrome Brick

# Warehouse Prices for Steel Products

## PITTSBURGH

	Base per Lb.
Plates	3.15c.
Structural shapes	3.15c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.90c.
Cold-finished and screw stock:	
Rounds and hexagons	3.20c.
Squares and flats	3.20c.
Hoops and bands under 1/4 in.	3.20c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.30c.
Galv. sheets (No. 24), 25 or more bundles	3.95c.
Hot-rolled sheets (No. 10)	2.95c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	\$3.69
Spikes, large	2.90c.
Track bolts, all sizes, per 100 count	65 per cent off list.
Machine bolts, 100 count	65 per cent off list.
Carriage bolts, 100 count	65 per cent off list.
Nuts, all styles, 100 count	65 per cent off list.
Large rivets, base per 100 lb.	\$3.50
Wire, black, soft ann'l'd, base per 100 lb.	\$2.70
Wire, galv. soft, base per 100 lb.	\$2.925
Common wire nails, per keg	\$2.834
Cement coated nails, per keg	\$2.834

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 9999 lbs.  
 \*Delivered in Pittsburgh switching district.

## CHICAGO

	Base per Lb.
Plates and structural shapes	3.20c.
Soft steel bars	2.95c.
Cold-finished steel bars:	
Rounds and hexagons	3.35c.
Plates and squares	3.35c.
Hot-rolled strip	3.30c.
Hot-rolled annealed sheets (No. 24)	3.85c.
Galv. sheets (No. 24)	4.55c.
Hot-rolled sheets (No. 10)	3.05c.
Spikes (keg lots)	3.50c.
Track bolts (keg lots)	4.65c.
Rivets, structural (keg lots)	3.65c.
Rivets, boiler (keg lots)	3.75c.
Machine bolts	Per Cent Off List
Carriage bolts	70
Lag screws	70
Hot-pressed nuts, sq. tap or	70
Hot-pressed nuts, hex. tap or	70
Hot-pressed nuts, hex. tap or	70
Hot-pressed cap screws	87 1/2
Out point set screws	80
Flat head bright wood screws, 50 and 20	85
Spring cotter pins	55
Stove bolts in full packages	70
Rd. hd. tank rivets, 7/16 in. and smaller	57 1/2
Wrought washers	\$4.50 off list
Black ann'l'd wire per 100 lb.	\$3.85
Com. wire nails, base per keg	2.95
Cement c'd nails, base per keg	2.95

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. All prices are f.o.b. consumers' plants within the Chicago switching district.  
 \*These are quotations delivered to city for quantities of 100 lb. or more. For lots of less than 100 lb., the quotation is 85 per cent off. Discounts applying to country trade are 70 per cent off, f.o.b. Chicago, with full or partial freight allowed up to 50c. per 100 lb.  
 †Prices for city and suburbs only.

## NEW YORK

	Base per Lb.
Plates, 1/4 in. and heavier	3.40c.
Structural shapes	3.37c.
Soft steel bars, small shapes	3.26c.
Iron bars	3.26c.
Iron bars, swd. charcoal, 5.75c. to 7.00c.	
Cold-finished, shafting and screw stock:	
Rounds and hexagons	3.81c.
Plates and squares	4.31c.
Cold-rolled; strip, soft and quarter hard	
Hoops	3.36c.
Bands	3.56c.
Hot-rolled sheets (No. 10)	3.31c.
Hot-rolled ann'l'd sheets (No. 24*)	3.89c.
Galvanized sheets (No. 24*)	4.50c.
Long term sheets (No. 24)	5.20c.
Standard tool steel	1.00c.
Wire, black annealed (No. 10)	3.40c.
Wire, galv. (No. 10)	3.75c.
Tire steel, 1 x 1/2 in. and larger	3.65c.
Open hearth spring steel, 4.00c. to 10.00c.	
Common wire nails, base per keg	\$3.21
Machine bolts, cut thread:	Off List
All diameters	85 and 10
Carriage bolts, cut thread:	
All diameters	85 and 10

	Per 100 Ft.
Boiler tubes:	
Lap welded, 2-in.	\$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.91
Charcoal iron 4-in.	63.65

\*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

## ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.45c.
Bars, soft steel or iron	3.20c.
Cold-finished, shafting, screw	
stocks	3.60c.
Hot-rolled annealed sheets (No. 24)	4.10c.
Galv. sheets (No. 24)	4.65c.
Hot-rolled sheets (No. 10)	3.30c.
Black corrug. sheets (No. 24)	4.10c.
*Galv. corrug. sheets	4.05c.
Structural rivets	4.00c.
Boiler rivets	4.10c.
Tank rivets, 7/16 in. and smaller	55
Machine and carriage bolts, lag screws, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts:	
All quantities	70

\*No. 26 and lighter take special prices.

## PHILADELPHIA

	Base per Lb.
*Plates, 1/4-in. and heavier	2.98c.
*Structural shapes	2.98c.
*Soft steel bars, small shapes, iron bars (except bands)	2.93c.
*Reinforce. steel bars, sq. twisted and deformed	2.96c.
Cold-finished steel bars	3.61c.
*Steel hoops	3.43c.
*Steel bands, No. 12 and 3/16 in. incl.	3.18c.
Spring steel	5.00c.
*Hot-rolled anneal. sheets (No. 24)	3.65c.
*Galvanized sheets (No. 24)	4.30c.
*Hot-rolled annealed sheets (No. 10)	3.08c.
Diam. pat. floor plates, 1/4 in.	4.95c.
Swedish iron bars	6.35c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.  
 \*Base prices subject to deduction on orders aggregating 4000 lb. or over.  
 †For 50 bundles or over.  
 ‡For less than 2000 lb.

## CLEVELAND

	Base per Lb.
Plates and struc. shapes	3.31c.
Soft steel bars	2.95c.
Reinforce. steel bars	2.10c.
Cold-finished steel bars	3.25c.
*Flat-rolled steel under 1/4 in.	3.86c.
Cold-finished strip	3.90c.
Hot-rolled annealed sheets (No. 24)	3.96c.
Galvanized sheets (No. 24)	4.61c.
Hot-rolled sheets (No. 10)	3.11c.
Hot-rolled 3/16 in. 24 to 48 in. wide	3.56c.
*Black ann'l'd wire, per 100 lb.	\$2.75
*No. 9 galv. wire, per 100 lb.	3.10
*Com. wire nails, base per keg	2.70

†Outside delivery 10c. less.  
 ‡For 5000 lb. or less.

## CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.42c.
Bars, soft steel or iron	3.17c.
New billes reinforce. bars	3.25c.
Rail steel reinforce. bars	3.25c.
Hoops and bands, 3/16 in. and lighter	3.47c.
Cold-finished bars	3.57c.
Hot-rolled annealed sheets (No. 24)	4.02c.
Galv. sheets (No. 24)	4.72c.
Hot-rolled sheets (No. 10)	3.22c.
Structural rivets	4.35c.
Small rivets	55 per cent off list
No. 9 ann'l'd wire, per 100 lb. (1000 lb. or over)	\$2.88
Com. wire nails, base per keg	3.04
Cement c'd nails, base 100-lb. keg	3.50
Chain, 1 in. per 100 lb.	8.35
Seamless steel boiler tubes, 2-in.	\$22.66
4-in.	48.14
Lap-welded steel boiler tubes, 2-in.	19.35
4-in.	45.39

## BUFFALO

	Base per Lb.
Plates	3.38c.
Struc. shapes	3.25c.
Soft steel bars	3.00c.
Reinforcing bars	2.60c.

Cold-finished flats and sq.	3.40c.
Round and hex.	3.40c.
Cold-rolled strip steel	3.19c.
Hot-rolled annealed sheets (No. 24)	4.06c.
Heavy hot-rolled sheets (3/16 in. 24 to 48 in. wide)	3.63c.
Galv. sheets (No. 24)	4.70c.
Bands	3.43c.
Hoops	3.43c.
Heavy hot-rolled sheets	3.18c.
Com. wire nails, base per keg	\$3.35
Black wire, base per 100 lb. (2500-lb. lots or under)	3.55
(Over 2500 lb.)	3.45

## BOSTON

	Base per Lb.
Beams, channels, angles, tees, zees	3.54c.
Plates—Sheeted, tank and univ. mill, 1/4 in. thick and heavier	3.56c.
Floor plates, diamond pattern	3.56c.
Bar and bar shapes (mild steel)	3.35c.
Bands 3/16 in. thick and No. 12 ga. incl.	4.65c.
Half rounds, half oval, oval and bevels	4.60c.
Tire steel	4.60c.
Cold-rolled strip steel	3.245c.
Cold-finished rounds, squares and hexagons	3.90c.
Cold-finished flat, square, hexagon	3.75c.
B'ue annealed sheets, No. 10 ga.	3.65c.
One pass cold-rolled sheets No. 24 ga.	4.20c.
Galvanized steel sheets, No. 24 ga.	4.90c.
Lead coated sheets, No. 24 ga.	5.85c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials.

## DETROIT

	Base per Lb.
Soft and bars	3.04c.
Structural shapes	3.42c.
Plates	3.42c.
Floor plates annealed sheets (No. 24)	3.94c.
Hot-rolled sheets (No. 10)	3.14c.
Galvanized sheets (No. 24)	4.72c.
Bands	3.39c.
Hoops	3.39c.
Cold-finished bars	3.18c.
Hot-rolled alloy steel (S.A.E. 3100 Series)	5.29c.
Bolts and nuts	70 and 5 per cent off list

Prices delivered by truck in metropolitan Detroit, subject to quantity differentials.  
 \*Price applies to 1,000 lb. and over.

## MILWAUKEE

	Base per Lb.
Plates and structural shapes	3.51c.
Soft steel bars	3.06c.
Hot-rolled strip	3.41c.
Hot-rolled sheets (No. 10)	3.16c.
Hot-rolled annealed sheets (No. 24)	3.96c.
Galvanized sheets (No. 20)	4.66c.
Cold-finished steel bars	3.46c.
Cold-rolled strip	3.33c.
Structural rivets (keg lots)	3.86c.
Boiler rivets, cone head (keg lots)	3.96c.
Boiler rivets, rd. head (keg lots)	3.86c.
Track spikes (keg lots)	3.71c.
Track bolts (keg lots)	4.86c.
*Black annealed wire	3.25c.
*Com. wire nails	2.95c.
Cement coated nails	2.90c.
Machine bolts	70 and 10
Carriage bolts	70 and 10
Hot-pressed nuts, sq. and hex. tapped or blank (keg lots)	70 and 10

Prices given above are delivered Milwaukee.  
 On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. On galvanized and No. 24 hot-rolled annealed sheets the prices given apply on orders of 400 to 1500 lb. On cold-finished bars the prices are for orders of 1000 lb. or more of a size.  
 \*For quantities of 500 to 2500 lb. assorted black annealed and galvanized wire.  
 †For orders of 50 kegs or less.

## ST. PAUL

	Base per Lb.
Mild steel bars	3.20c.
Structural shapes	3.45c.
Plates	3.45c.
Cold-finished bars	3.57c.
Bands and hoops	3.55c.
Hot-rolled annealed sheets, No. 24	3.90c.
Galvanized sheets, No. 24	4.50c.
Cold-rolled sheets, No. 20	4.95c.

On mild steel bars, shapes, plates and hoops and bands the base applies on 400 to 14,999 lb. On cold-finished bars, hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over.

## BALTIMORE

	Base per Lb.
*Mild steel bars	2.95c.
*Iron bars	2.95c.

*Reinforcing bars	2.95c.
*Structural shapes	3.00c.
*Plates	3.00c.
*Hot-rolled sheets, No. 10	3.10c.
*Hot-rolled annealed sheets, No. 24	3.60c.
*Galvanized sheets, No. 24	4.30c.
*Bands	3.20c.
*Hoops	3.45c.
*Cold-rolled rounds	3.58c.
*Cold-rolled squares, hex. and flats	3.58c.
Rivets	4.40c.
Bolts and nuts, per cent off list	.60 and 10

\*Quantity extras per size apply. †Quantity extras per thickness apply. Hot-rolled quantity extras are: 2000 lb. and over, base: 1500 lb. to 1999 lb. add 15c. per 100 lb.; 1000 lb. to 1499 lb. add 30c.; 0 to 999 lb. add 50c.  
 ‡50 bundles and over, base. For 1 to 49 bundles add 50c. per 100 lb.; for 18 to 49 bundles add 25c.  
 §Base for 1000 lb. and over. For 500 to 999 lb. add 25c. per 100 lb.; for 300 to 499 lb. add 75c.; for 0 to 299 lb. add \$1.25.

## CHATTANOOGA

	Base per Lb.
Mild steel bars	3.31c.
Iron bars	3.31c.
Reinforcing bars	3.31c.
Structural shapes	3.56c.
Plates	3.56c.
Hot-rolled sheets, No. 10	3.96c.
Hot-rolled annealed sheets, No. 24	4.51c.
Galvanized sheets, No. 24	4.86c.
Steel bands	3.61c.
Cold-finished bars	3.98c.

## MEMPHIS

	Base per Lb.
Mild steel bars	3.42c.
Shapes, bar size	3.42c.
Iron bars	3.42c.
Structural shapes	3.67c.
Plates	3.67c.
Hot-rolled sheets, No. 10	3.47c.
Hot-rolled annealed sheets, No. 24	4.27c.
Galvanized sheets, No. 24	4.97c.
Steel bands	3.72c.
Cold-drawn rounds	5.72c.
Cold-drawn flats, squares, hexagons	5.89c.
Structural rivets	4.25c.
Bolts and nuts, per cent off list	65
Small rivets, per cent off list	50

## NEW ORLEANS

	Base per Lb.
Mild steel bars	3.30c.
Reinforcing bars	3.50c.
Structural shapes	3.56c.
Plates	3.55c.
Hot-rolled sheets, No. 10	3.55c.
Hot-rolled annealed sheets, No. 24	4.50c.
Galvanized sheets, No. 24	4.98c.
Steel bands	3.96c.
Cold-finished steel bars	3.96c.
Structural rivets	4.15c.
Boiler rivets	4.26c.
Common wire nails, base per keg	\$3.10
Bolts and nuts, per cent off list	70

## PACIFIC COAST

	Base per Lb.
San Francisco	
Los Angeles	
Seattle	
Plates, tank and U. M.	3.55c.
Shapes, standard	3.55c.
Soft steel bars	3.60c.
Reinforcing bars, f.o.b. cars dock	3.60c.
*Pacific ports	2.45c.
Hot-rolled annealed sheets (No. 24)	2.45c.
Hot-rolled sheets (No. 10)	4.35c.
Galv. sheets (No. 24)	3.75c.
Galv. sheets (No. 10)	3.70c.
Cold finished steel	3.75c.
Rounds	5.00c.
Squares and hexagons	4.95c.
Plates	5.85c.
Common wire nails—base per keg less carload	5.95c.
	\$3.30 \$3.40 \$3.30

All items subject to differentials for quantity.

## TOOL STEEL

Prices are same for warehouse distribution at all points on or East of Mississippi River. West of Mississippi quotations are 1c. a lb. higher.	
	Base per Lb.
High speed	57c.
High carbon chrome	37c.
Oil hardening	29c.
Extra	17c.
Regular	14c.



# Demand Is Sustained In Cleveland District



Ingot Output Unchanged at 66 Per Cent—Automotive Ordering Still Lags  
C. & O. Inquires for Rails

CLEVELAND, Sept. 24.—Sustained by a broad miscellaneous demand, the finished steel market is retaining the activity it has displayed for several weeks. Mills are still depending to a large extent upon consumers outside the automotive field for orders.

While orders from motor car manufacturers are fairly numerous, they are for small lots. The looked-for round-lot buying by this industry for new models has not yet started.

Ingot output in the Cleveland-Lorain territory is unchanged this week at 66 per cent of capacity.

Steel bars are moving in good volume to miscellaneous users whose orders account for 50 per cent of the business, the remainder coming from the automotive field. Consumers are ordering for early needs except where, because of changes in quantity extras, they will gain a price advantage by stocking up before Oct. 1. The change in quantity extras for hot-rolled bars eliminating an extra on 5 to 10 lots has been very favorably received by forge shops and other consumers. However, the sharp advance on forging quality billets under 5 by 5 in. and down to 4 by 4 in. that are being put on a bar base, resulting in an advance in some cases to about 50 per cent, is being strongly resisted by buyers.

Sheets continue to move in very good volume to manufacturers of household equipment and other miscellaneous users.

Activity in the construction field continues light and is limited mostly to private work.

The Chesapeake & Ohio Railroad will purchase 21,842 tons of rails and 1000 tons of track materials, bids for which will be taken Sept. 30.

## Pig Iron

Buying for the fourth quarter continues in good volume, although sales are not as heavy as earlier in the month. Orders placed during the week range from small lots up to 6000 tons. The business has been

well divided among consumers in various industries, and a large percentage of foundries in this territory are now under contract for the fourth quarter. Manufacturers of sanitary ware and heating equipment continue to take good shipments and foundries making automobile castings are getting busier, which has resulted in an increase in releases from foundries in that field. The jobbing foundry situation is spotty.

## Iron Ore

Consumption of Lake Superior ore in August amounted to 2,615,927 tons, an increase of 417,738 tons over July and comparing with 1,443,943 tons in August last year. Furnace stocks Sept. 1 amounted to 26,935,791 tons, and there was 31,490,714 tons at furnaces and Lake Erie docks on that date as compared with 32,674,318 tons on the same date last year. Central district furnaces in August consumed 1,357,115 tons, an increase for the month of 239,756 tons. Lake front furnaces used 1,248,034 tons, a gain of 178,106 tons, and all-rail furnaces melted to 10,778 tons, a gain of 1165 tons. Eastern furnaces used no Lake ore during the month. There were 90 furnaces that used Lake ore in blast Aug. 31, an increase of seven for the month.

## Sheets

Miscellaneous demand continues good and orders from the automotive industry show a slight increase. Mills, however, are still waiting for round-lot business from that source. No further buying has come from refrigerator manufacturers, who recently purchased small lots for starting the production of new models. Orders from jobbers are good. The local sheet mills will operate at capacity this week.

## Strip Steel

Automobile parts makers are specifying in moderate volume and miscellaneous business is quite good. Manufacturers of electrical

appliances are ordering cold-rolled strip, and there is some new demand for hot-rolled material from agricultural implement manufacturers. The local hot-rolled strip mills are operating this week at 75 per cent of capacity.

## Bars, Plates and Shapes

Merchant bars are in good demand from various miscellaneous consumers, including bolt and nut, agricultural implement, road machinery and garden tool manufacturers. Orders from forge shops doing automotive work show a moderate decline because of the lack of substantial releases by automobile manufacturers. Makers of seamless steel tubing are ordering tube rounds quite freely. Steel fabricating plants are fairly well filled with small private work, but few new projects are coming out. There is a dearth of public work. Inquiry includes 317 tons for a factory building in Columbus, and 200 tons for a State highway bridge. Reinforcing bars are dull, and reports indicate price irregularities on the part of jobbers.

## Scrap

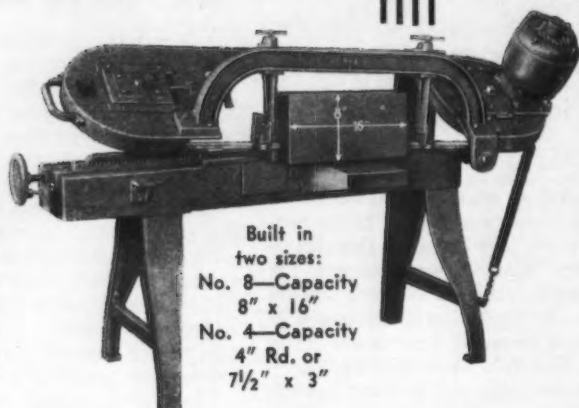
The market is quieter than for several weeks. However, the expectation of a new buying movement shortly is tending to hold prices to recent levels. Dealers are still buying some scrap for Cleveland delivery, paying \$12 to \$12.25 for No. 1 heavy melting steel and \$8 for blast furnace scrap. Cast scrap is fairly active and prices on that grade and on railroad malleable have advanced.

## Large Structural Awards at St. Louis

ST. LOUIS, Sept. 24.—Fabricators in the St. Louis industrial district were awarded nearly 10,000 tons of structural steel during the last week, including 7500 tons placed with the Mississippi Valley Structural Steel Co. for the post office here, 2120 tons placed with Stupp Brothers Bridge & Iron Co. for a Lake-of-the-Ozarks bridge, and 125 tons for a building in East St. Louis and 135 tons for a prison building near Jefferson City, which went to the St. Louis Structural Steel Co. In addition, the United Construction Co., low bidder on Lock No. 25 in the Mississippi River, is committed to the Mississippi Valley Structural Steel Co. for the required structural steel, amounting to 1300 tons. The lock also requires 114,000 sq. ft. of

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# WELLS METAL CUTTING BAND SAW

sheet steel piling and 558 tons of reinforcing bars, uncommitted.

Stiers Brothers Construction Co. is low bidder on the Watson Road bridge in St. Louis County, requiring 125 tons of reinforcing bars. Bids will be opened Oct. 2 on the Southwest High School, St. Louis, requiring 150 tons of structural steel and an undetermined tonnage of reinforcing bars.

Abandoning the hand-to-mouth buying which has prevailed for so long in the pig iron trade, melters

are committing themselves now for their expected requirements for the fourth quarter, and the opening of that period will see heavier bookings than have existed at any previous quarter's opening for several years. Melters believe that higher prices will be put into effect, and that it is to their advantage to buy now rather than to wait. Buying is general as to industries.

About the only activity in the scrap market here is in foundry grades, for which there has been a

good steady demand, without any large individual orders being placed. Country scrap is coming in more freely. Mills in the district are said to be supplied with enough scrap to last them for 90 days, and they are not expected to come into the market for any sizable tonnages until about Nov. 1. No. 2 heavy melting steel is up 25c. a ton. The St. Louis Southwestern has sold 20 carloads of miscellaneous scrap. The list of 1000 tons issued by the Missouri-Kansas-Texas went mostly to Western markets.

## Scrap Buoyant At Detroit

DETROIT, Sept. 24.—Although heavy melting steel and hydraulic bundles are unchanged, a number of other scrap items have advanced 25c. a ton. There has been a fairly good movement of borings and turnings by water to Cleveland and of heavier scrap to Buffalo. Dealers report hold-ups of further shipments to a Youngstown interest and to a central Indiana steel mill. Scrap is coming out in much greater volume than a month ago.

## Steel Demand Improves In South

BIRMINGHAM, Sept. 24.—There is a steady daily demand for steel, with sheets and wire products the most active. Farm demand for the latter products has strengthened and will become even better in October and November, with the further marketing of crops. Projects requiring plates, shapes and bars are also becoming more numerous. In general, September bookings have been excellent, and steel manufacturers are in better spirits than for a long while.

Pig iron buying is moving forward slowly, but with some improvement. September shipments will likely be about 15 per cent ahead of those for last month.

Six blast furnaces and 11 open-hearth are active, no changes having occurred in the past several weeks. Another blast furnace may go into production this week or next.

The outlook for cast iron pipe is now somewhat hazy on account of friction in Washington between the PWA and WPA. Several projects, counted on for early award, have been thrown out and others will likely follow or be delayed. Present new business is mostly in small lots. September production and



shipments will about parallel August.

The Bessemer, Ala., plant of the Pullman-Standard Car Mfg. Co. is fabricating about 2500 tons of steel for its Richmond, Va., plant, which is building 500 cars for the Norfolk & Southern Railway. Virginia Bridge & Iron Co. began shipments last week on 600 tons of bridge steel for the Cotton Belt Railroad in Arkansas. Hardie-Tynes Mfg. Co. has booked two more butterfly valves for Boulder Dam, which will weigh between 450 and 500 tons.

## Large Projects Up For Bids on Coast

SAN FRANCISCO, Sept. 23.—A 25.05-mile unit of the Colorado River aqueduct will be included in Specification No. 115, on which the Metropolitan Water District will open bids Oct. 24 at Los Angeles. The size of the pipe is to vary from 130 in. in welded steel to 156-in. in in-place reinforced concrete alternate. Tonnage figures are not yet known.

At Portland, Ore., the United States Engineers will take bids Oct. 8 for the construction of the Bonneville powerhouse superstructure and completion of the substructure; also for the construction of the Bradford Island fish ladder. A total of 3400 tons of reinforcing bars, 391 tons of structural steel and 100 tons of miscellaneous steel is involved.

In central California a call for bids, to be opened Oct. 9, on the Peralta Street undercrossing in Oakland, was the outstanding new offering. Approximately 1100 tons of bars will be required. The long-awaited award of the United States Coast Guard bulkhead at Government Island, Calif., has just been made to Ben C. Gerwick. No letting has yet been reported on the 3000 tons of sheet piling involved.

United States Pipe & Foundry Co. booked 1995 tons of cast iron pipe for the city of San Francisco, the largest letting of the week. In Los Angeles, Consolidated Steel Corp. will furnish water stops, involving 500 tons of plates, for the Metropolitan Water District. Truscon Steel Co. was the successful bidder on 500 tons of reinforcing bars for a 10-story building at San Francisco.

Despite the favorable tonnages required for the three outstanding new projects of the week, listings are few and mostly for minor tonnages. Warehousemen report a slight pickup in business.

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## Railroad Equipment

Norfolk & Western is building two freight locomotives and 10 all-steel covered hopper cars in its Roanoke, Va., shops.

Atchafalaya, Topeka & Santa Fe is rebuilding 150 refrigerator cars into all-steel units with improved ventilation.

St. Louis-San Francisco will build two lounge cars in its own shops.

United Fruit Co. has placed order with Baldwin Locomotive Works for one 2-8-2 type locomotive for use in Cuba.

American Railroad of Puerto Rico has ordered bearings and boxes to equip journals of two passenger cars from Timken Roller Bearing Co.

Amory Trading Corp. has divided 14,000 freight car axles, totaling 4500 tons,

between Carnegie Steel Co. and Bethlehem Steel Co.

Virginian has placed repair parts for 200 freight cars with various car builders. These represent the first orders for a 1500-car repair program.

## RAILS AND TRACK SUPPLIES

Chesapeake & Ohio Railroad will take bids Sept. 30 for 21,842 tons of rails and about 1000 tons of accessories, including 636,611 tie plates, 28,485 pairs of splice bars and 5305 kegs of spikes.

New York Central has placed contracts for 7400 tons of rails, together with angle bars, track fastenings and accessories.

Santa Fe will spend \$3,500,000 for betterment of its right-of-way to permit the speeding up of train schedules.

# Philadelphia Sales Level Off—Operations Unchanged



District Mills in Need of Highway  
and Railroad Purchases—Sheet De-  
liveries at Year's High Point—Scrap  
Continues Firm

**P**HILADELPHIA, Sept. 24.—Bookings of miscellaneous flat-rolled steel have been generally in excess of the total for any other month this year, with autobody stamping plants, jobbers, railroads, radio makers and stove makers all participating in the demand. However, local fabricators have again encountered a dull period for shapes and bars. Most of the heavy tonnages in this area have been let and little new work is coming up for immediate bidding. Likewise, considerable capacity in this territory is dependent on railroad and shipyard buying. The railroads continue to limit purchases to skeleton routine requirements, while shipbuilders have placed a considerable proportion of their required tonnage with mills in the West.

All district mills continue to operate at a rate practically unchanged from last week. Consequently, the average eastern Pennsylvania operating rate is listed at 38 per cent of capacity for the week. It is quite possible that miscellaneous demands may again tend upward in sufficient volume to lift the district average to 40 per cent during the coming month. But there are no significant tonnages active in this territory, and consequently a sharp rise in operations is not to be expected.

## Pig Iron

All sellers have a fair supply of orders on hand for the first time in many months. Melters who

heretofore have ordered from hand to mouth are now buying well into the fourth quarter to protect themselves against possible advances in prices. If the coal strike should continue, a price rise would seem likely. But furnaces will probably be hesitant about such action, for it would tend to open up the market even further for foreign brands. The Birdsboro, Pa., stack will probably go into blast during the next week, making 400 tons of foundry and basic grades daily. A good portion of this output must find an outlet in this and nearby territories.

## Sheets and Strip

Large sheet users have ordered well into November and the present period is consequently quite dull as regards fresh business. Deliveries on old orders are well ahead of schedule, and September shipments will probably exceed the total for any other month this year. The jobbers' allowance on galvanized sheets, currently \$2 a ton, will be withdrawn Oct. 1. A number of jobbers have objected strenuously to this change and have asked for the restoration of some form of concession. So far mills have practically ignored these demands.

## Bars, Plates and Shapes

Buyers are placing fair-sized orders of cold-finished material and hot-rolled bars to escape impending advances in base prices and extras.

Just how rigidly the mills will adhere to these new price schedules will probably not be determined until jobbers liquidate current purchases and are forced back into the market for sizable tonnages at the advanced price levels. The weakness which had previously developed in reinforcing bars continues untested in the absence of large tonnages up for bidding. Jobs calling for fabricated structural shapes are disclosing wide variations in bid prices. It is evident that smaller fabricators are setting a stiff price pace for the larger plants, much to their consternation. Retaliation may take the usual form of drastic underselling of the market on all jobs, large or small. New York Shipbuilding Corp., with strike difficulties settled, is again releasing shipments of steel which had been held up for several months. Also, this company will have the opportunity of preparing a figure on a Navy cruiser which will be rebid on Oct. 2. This cruiser will take 4000 tons of plain carbon steel and 1500 tons of special treatment steel. An order of plain carbon steel of this size would be of considerable help to district mills. Larger awards of shapes during the week include 300 tons for a Washington, D. C., sewage plant to Fort Pitt Bridge Works, Inc., and 700 tons to Belmont Iron Works for a Tarrytown, N. Y., Chevrolet assembling plant.

## Imports

The following iron and steel imports were received here last week: 1599 tons of pig iron from British India and 235 tons of the same product from Norway, and 90 tons of steel tubes, 22 tons of steel wire, 17 tons of steel bars and 3 tons of steel forgings from Sweden.

## Scrap

The market continues devoid of important new buying, as mills are unwilling to meet broker demands and brokers, in turn, continue somewhat nervous and none too anxious

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to sell. Consequently current activity is made up of occasional mill-dealer purchases and steady broker buying to cover old orders. Only a few odd carlots have been delivered to Port Richmond for export, and the accumulation there is still far from sufficient to make up a cargo. Last week the strong tone of the steel market was upheld when the Philadelphia Navy Yard sold 400 tons of No. 1 steel for \$11.06, f.o.b. Philadelphia. The second bid was \$10.91. Total scrap exports for August amounted to 156,685 tons, as compared with the exceptionally heavy July figure of 205,779 tons. Of the August tonnage, Italy took 33,078 tons, 23,758 tons went to the United Kingdom and Japan received 82,604 tons.

## Cast Iron Pipe

Procurement Division, United States Treasury Department, New York, has received bids for 276 tons of 6, 8, and 10-in.

State of Wisconsin, C. E. Tracy, procurement officer, is taking bids on 3725 lin. ft. of 6-in. for projects at La Crosse and Monroe.

Appleton, Wis., has placed 4720 ft. of 4 to 12-in. class C with James B. Clow & Sons.

Niagara, Wis., plans \$40,000 waterworks improvement. Federal Engineering Co., Davenport, Iowa, is in charge.

Town Preble, Brown County, Wis., plans \$185,000 water system. H. R. Albert, 101 North Washington Street, Green Bay, Wis., is engineer.

Edgar, Wis., has plans by W. G. Kirchoffer, 22 North Carroll Street, Madison, Wis., for \$75,000 waterworks and sewerage systems.

Little Chute, Wis., has placed 3700 ft. of 6-in. with United States Pipe & Foundry Co.

Galena Park, Tex., plans about 12,100 ft. of 6 to 10-in. for water supply; also elevated steel tank and tower, and other waterworks installation. Cost about \$71,000. Financing is being arranged through Federal aid. J. C. McVea, Bellaire Boulevard, Houston, Tex., is consulting engineer.

Philadelphia plans new pipe line for water supply near Philadelphia Hospital for Mental Diseases, Byberry. Cost about \$23,800.

Little Rock, Ark., has made application for Federal financing in amount of \$3,500,000 for trunk pipe line to new water supply source, totaling 231,200 ft., large diameter and smaller sections, including new dam construction. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Fullerton, Cal., plans pipe lines for water supply extensions in Valencia Drive and other streets. Cost about \$30,400. Financing is being arranged through Federal aid. Herman Hiltcher is city engineer.

Petalia, Tex., plans pipe lines for water system; also elevated steel tank and tower and pumping station. Fund of \$50,000 is being financed through Federal aid. J. E. Ward, Harvey-Snyder Building, Wichita Falls, Tex., is consulting engineer.

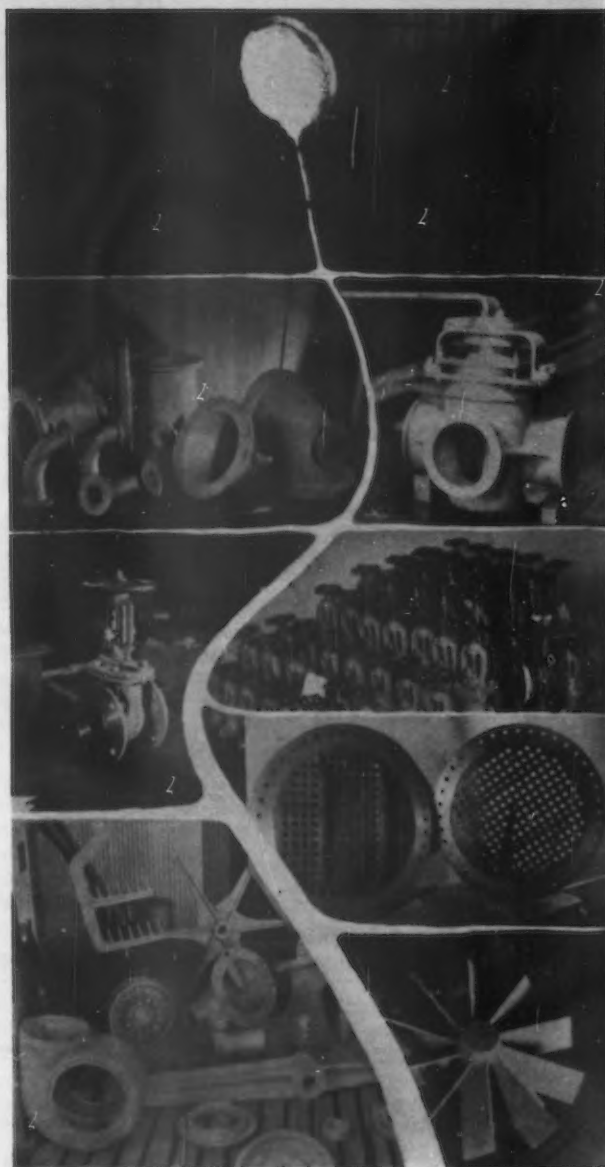
Piscataway Township Committee, Piscataway, N. J., plans pipe lines for water supply in different parts of township; also pumping station and other waterworks installation. Cost about \$100,000. C. J. Kupper, 409 East Main Street, Bound Brook, N. J., is engineer.

McLouth, Kan., plans pipe lines for water system. Fund of \$47,200 is being arranged through Federal aid for this and other waterworks construction. E. T. Archer & Co., New England Building, Kansas City, Mo., are consulting engineers.

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"Modernization" that will improve your plant or make your products better, at lower cost. Why not write ALLOY STEEL Division, The Duriron Company, Dayton, Ohio

Newark, Ohio, plans pipe lines for extensions in water system. Fund of \$20,500 is being arranged. City will purchase materials.

Essex, Mass., has plans for water pipe lines, elevated steel tank and tower, and other waterworks installation. Financing is being arranged. Whitman & Howard, 89 Broad Street, Boston, are consulting engineers.

Orange Grove, Tex., plans pipe lines for water system. Fund of \$46,000 is being arranged through Federal aid for this and other waterworks construction. H. R. F. Holland, Frisco Bank Building, San Antonio, Tex., is consulting engineer.

San Francisco has let 1995 tons of 6 and 8-in. to United States Pipe & Foundry Co.

Homedale, Idaho, has placed 125 tons with an unnamed bidder.

Fresno, Cal., has awarded 300 tons of 4 to 10 in. to United States Pipe & Foundry Co.

Seattle, Wash., has awarded 230 tons of 12-in. to United States Pipe & Foundry Co.

Bloomington, Idaho, has placed 170 tons with an unnamed bidder.

# War Insurance Holds Up Scrap Exports from New York



Damage to Vegetable Packs Reduces  
Tin Plate Consumption—Anticipatory  
Orders for Bars and Galvanized Sheets  
Increase

**N**EW YORK, Sept. 24—The war scare has thus far had no visible effects on the iron and steel market here except in the case of scrap. Italy took 33,000 tons of scrap from this port in August and would have taken again as much or more this month but for a sharp advance in insurance rates, which has held up a number of boats which were on the point of sailing.

Finished steel demand is spotty but shows little change in trend. The bloom is definitely off the rose so far as tin plate business is concerned. Excessive rain has cut down corn and tomato crops with the result that mills are having difficulty in obtaining releases for the plate they are holding in stock, while can companies may find it necessary to carry considerable of this year's stocks of plate into next year.

The approach of Oct. 1 has accelerated the placing of anticipa-

tory orders for bars and galvanized sheets, but otherwise buying is on a hand-to-mouth basis. The New York Central will open Clayton act bids for its miscellaneous fourth quarter requirements Sept. 26. However, the flow of steel to the carriers remains at a low ebb and will not improve unless carloadings show sustained betterment.

The Board of Transportation, New York, which will take bids on the first section of the Sixth Avenue subway, Manhattan, Oct. 4, will ask for tenders shortly on other sections. The entire project will call for close to 30,000 tons of steel.

Grade crossing elimination projects are slow in reaching the contracting stage, and it is feared that many of them will be postponed until it can be determined where undertakings of this kind will do the most good politically.

Second-hand structural shapes,

principally from the Century of Progress at Chicago, have become a competitive factor in this market.

## Pig Iron

Generous buying of pig iron in this area last week brought total bookings to approximately 5600 tons, compared with 2000 tons last week. As a result, the market has an optimistic tone, and further expansion is looked for. Quite a number of sizable individual sales figured in the total turnover, all of which were for fourth quarter delivery. Some of these, it is definitely known, ran to 500-ton lots. Sellers attribute the market's improvement mostly to normal fall development, though military precautions have had some influence, and possibly, to a lesser degree, anticipatory buying took place. The smaller jobbing foundries have not figured much in recent transactions. Possibly they were last week even a little less active than in the preceding period. Sanitary ware makers are active buyers, but demand on the whole has been well diversified. Owing to this circumstance, the market has strengthened considerably, and prices are firm.

## Reinforcing Steel

Though sizable inquiries are coming into the market, and some substantial tonnages have been let, most sellers appear unimpressed. Instances of price weakness are still reported and are having a depressing effect on the market. American Steel & Wire Co. was awarded 235 tons of bars and mesh for the resettlement project at Hightstown, N. J., and Igoe Brothers took 125 tons of reinforcing bars for a sewer at Elizabeth, N. J. Pending awards, however, are more impressive. New York is taking bids on 2700 tons for a Queens sewer, and will soon ask for tenders on roughly 5750 tons of reinforcing steel for the Tri-boro Bridge.

## Scrap

All prices on important grades continue very firm, with brokers steadily loading barges for export and cars for eastern Pennsylvania delivery. The strong undertone has made brokers wary, and there has been very little booking ahead of sizable tonnages. Foreign inquiries are constantly in the market, but offers are generally too low to cover potential brokers risks. Old Japanese contracts are about cleaned up, but slightly improved business conditions in the Orient are leading to the belief that heavy buying from that quarter will soon

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reappear. Italy is also anxious to buy additional tonnages, but shipments to that country on old contracts are currently being delayed due to the inability to secure reasonable insurance rates. As was expected, scrap exports in August dropped considerably, having been 156,685 tons to all countries. This figure compares poorly with the July figure of 205,779 tons, although it should be pointed out that July was excessively high due to hold-overs from June, which was the month of the boat shortage.

## Export Scrap Loading Checked at Boston

**B**OSTON, Sept. 24.—Because of the tension in the European situation a number of steamers chartered to load scrap here for Italy have been withdrawn. However, a steamer with 2000 tons for Gdynia, Poland, left here the past week, and another boat with 1600 tons loaded at Portsmouth, N. H., and 2000 tons taken here is scheduled to sail for Italy this week. The last-mentioned steamer, a 4,572-ton vessel, has been sold to Italian shipbreakers. One local exporter anxious to complete old Italian contracts because of embargo possibilities, is paying \$9.75 a ton delivered dock for No. 1 steel and \$8.75 a ton for No. 2 steel. Other exporters with new contracts are offering about \$1 a ton less, but are not obtaining material. Prices on No. 1 and No. 2 steel for Pittsburgh delivery are up 50c. a ton, but the domestic market is purely nominal. A lot of 500 tons of cast iron has been sold to a New England foundry at just under \$9 a ton delivered, while smaller tonnages have changed hands at about 50c. a ton more.

Pig iron sales are holding up well. A Rhode Island melter has bought a round tonnage of low-silicon iron, and in addition approximately 1800 tons was sold to other consumers, largely Buffalo brands. More and more of the important foundries are evincing interest in fourth quarter iron, but are slow in making contracts. Largely because of the activity in Connecticut, the New England weekly melt is now better than 30 per cent of rated capacity, with indications of reaching 35 per cent by Oct. 1. A consignment of Indian iron is en route to Boston. Most of it has already been sold. Other foreign irons are moving slowly, and mostly in truck lots.

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## Valley Bookings Dip Pending Upturn in Automotive Demand

**Y**OUNGSTOWN, Sept. 23.—Demand for finished steel in the Valleys has diminished slightly in the past week. Aggregate bookings for September, however, probably will top those for August by a small margin.

The current trend in demand may be reversed soon if automobile makers place heavier tonnage for new model requirements, as expected late this month. Although ordinarily the volume of automobile steel being placed now could not be considered significant, the fact that such business is coming in at a time when it usually shrinks to mere fill-in lots attaches greater importance to the moderate tonnages being booked at this time of the year. Sheets are enjoying a relatively substantial demand for automobile consumption, but strip steel, hot-rolled bars and other automotive steel items are faring less favorably. Little change is discernible in miscellaneous demand. Unusual steadiness characterizes the call for steel from farm implement and machinery makers. Demand for galvanized sheets is strong. Interest in tin plate is dwindling in line with seasonal tendencies.

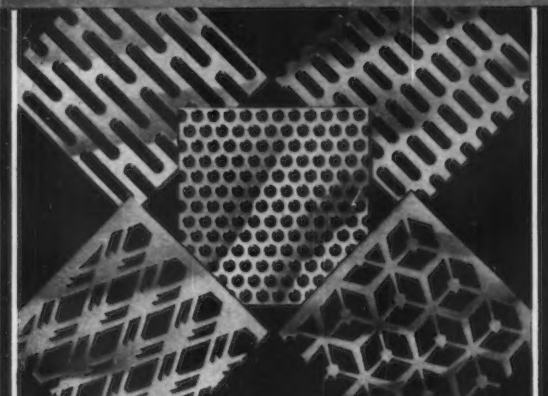
Valley producers of hot-rolled carbon bars are following the revised set-up of extras and deduc-

tions announced by Carnegie Steel Co. last week. Thus far, consumers have not rushed to take advantage of deductions for the larger quantities. Small users, too, have not displayed any unusual interest in covering in anticipation of the increased size and quantity extras to be applied on Oct. 1.

The effect of the slight check to steel demand on raw steel production is a matter of virtual daily fluctuation in open-hearth activity. In the current week, output for the Youngstown-Canton-Massillon-Warren district probably will be slightly lower, but schedules are quick to reflect any change in finished steel demand, and any sudden influx of steel orders would probably push the rate higher. Average production at the outset of this week is around 55 per cent. The chief loss in production was at the Brier Hill plant of the Youngstown Sheet & Tube Co., where three open-hearths were taken off late last week. Blast furnace schedules remain unchanged.

The slight hesitancy in the finished steel market has spread to the scrap market. No important buying of scrap has been uncovered in this district in the past half-month, and, at the moment, the leading mills are not showing

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any interest in covering. Scrap dealers are believed to be comfortably stocked, although fresh scrap supplies are regarded as being limited, particularly in view of the reduced production at automobile centers. Heavy melting steel is nominally quotable at around \$14, delivered.

### Navy to Buy 4500 Tons of Steel

**WASHINGTON, Sept. 24.**—The Navy Department yesterday issued invitations for bids to be opened Oct. 15 for 4459 tons of plates, shapes, bars and strips for a light cruiser and three submarines to be built in Navy Yards. The bids call for 2885 tons of medium and high-tensile plates, 1077 tons of medium and high-tensile shapes and 340 tons of medium bars and strips for the light cruiser, to be built in the Brooklyn Navy Yard.

The requirements for the three submarines consist of 157 tons of medium and high-tensile shapes. Two of the submarines are to be built in the Mare Island Navy Yard, and one will be constructed at Portsmouth, N. H. Bids will be asked later for special treatment plates for all four vessels.

Inquiries will also be sent out soon for steel for seven destroyers, completing the total of 11 ships recently allocated to Navy Yards in

connection with the new naval building program. At the same time awards were made to private yards for the construction of 12 vessels.

The invitations just issued carry a new clause marking a change in the buying policy of the Navy Department. Heretofore, contracts made held good during the life of the construction of ships. The new schedules carry a clause providing that contracts may be terminated by either the department or the contractor on two months' notice after the contract has run six months. If the market declines, it is assumed the department would cancel contracts and readvertise for the remainder of requirements not ordered against existing contracts. On the other hand, contractors will have the right to cancel unspecified balances in the event of a market rise if they are so disposed.

### Output in Further Rise at Buffalo

**BUFFALO, Sept. 24.**—The Lackawanna plant of the Bethlehem Steel Co. increased open-hearth operations by two units this week, raising the number of active furnaces to 11. By the end of the week, another is due to go in, making 12 altogether. Republic Steel Corp. is operating four furnaces; Wickwire Spencer Steel Co., two; the Seneca sheet division of Bethle-

hem is up to 75 per cent of capacity. This week is the busiest from a steel-making standpoint in many months.

State bridge jobs involving 500 tons of reinforcing bars were let Sept. 17, and projects requiring an equal tonnage were to be let today. A Buffalo concern is understood to have taken the principal part of last week's letting of reinforcing steel.

The pig iron market is active, with almost all consumers covering for fourth quarter. Much of this buying seems to be speculative. The stack of the Interlake Iron Corp., Erie, Pa., idle for five years, has been blown in.

The scrap market is strong on a good volume of small sales, principally No. 1 machinery cast at \$12.75 to \$13 and short rails at about \$15. Plants in general are reluctant to pay higher prices for scrap, but dealers seldom have evinced so much confidence in the strength of the market.

### Sheet Buying Expands At Cincinnati

**CINCINNATI, Sept. 24.**—With virtually all important users covered for fourth quarter, pig iron sales have settled back to the rate that has obtained for the past several months. A slight upturn in general inquiry, however, indicates that melters are concerned about current talk of possible price advances during the quarter, and wish to be prepared to expand inventories, if necessary, to avoid increased costs. Melt fluctuates within narrow limits.

Sheet steel demand increased the past week, bookings averaging about 90 per cent of capacity. Sharp increase in automotive orders, combined with the steady jobbing and miscellaneous demand, is responsible for the improved business. Rolling schedules will be raised this week to about 90 per cent of mill capacity to satisfy consumers' demands for prompt shipment. Steel ingot production is good, reports indicating operations at about 70 per cent of total capacity.

Consumers of scrap are proceeding cautiously, apparently feeling their way until fourth quarter possibilities are more clearly discernible. Accordingly, scrap sales to mill interests are restricted to small amounts at varying prices, users not being willing to recognize dealer insistence upon higher prices. Dealers' bids reflect speculative influences, but ruling market prices are unchanged.



# Fabricated Structural Steel

## NORTH ATLANTIC STATES

**Philadelphia**, 150 tons, Edgecomb Steel Co. warehouse addition, to Belmont Iron Works.

**Washington**, 300 tons, sewage plant, to Fort Pitt Bridge Works, Inc.

**Newark, N. J.**, 565 tons, Central Railroad of New Jersey bridge, to Phoenix Bridge Co.

**Tarrytown, N. Y.**, 700 tons, Chevrolet assembling plant, to Belmont Iron Works.

**Boston**, 150 tons, school repairs, to Bethlehem Fabricators, Inc.

**Dartmouth, Mass.**, 100 tons, bridge, to an unnamed fabricator.

**Bancroft, Conn.**, 160 tons, Atlantic Wire Co. mill building, to McClintic-Marshall Corp.

**New York**, 1750 tons, pier shed No. 25 for Eastern Steamship Co., to McClintic-Marshall Corp.

**Tarrytown, N. Y.**, 720 tons, plant addition for Chevrolet Motor Co., to Belmont Iron Works.

**Sayre, Pa.**, 160 tons, factory addition, to Seneca Engineering Co.

**Bridgeton, N. J.**, 695 tons, Cohansey River bridge, to Virginia Bridge & Iron Co.

**Philadelphia**, 285 tons, additions to warehouse, to Belmont Iron Works.

**Pittsburgh**, 310 tons, alterations to International Furniture Co. building, to Levinson Mfg. Co.

**Pittsburgh**, 280 tons, buildings for American Oil Co., to Keystone Engineering Co.

**Pittsburgh**, 240 tons, shapes and plates; Allegheny River lock and dam No. 9, to Independent Bridge Co.

**Mapletown, Pa.**, 150 tons, bridge over Juniata River, to Belmont Iron Works.

**Washington**, 315 tons, unit No. 5 of sewage plant, to Fort Pitt Bridge Works Co.

## SOUTHWEST

**Guadalupe County, Ariz.**, 184 tons, two State bridges, to Minneapolis-Moline Power Implement Co.

## CENTRAL STATES

**Springfield, Ohio**, 120 tons, State highway bridge, to Fort Pitt Bridge Works Co.

**Northville, Mich.**, 135 tons, Ford factory building, to Whitehead & Kales, Inc.

**St. Louis**, 7500 tons, post office, to Mississippi Valley Structural Steel Co.

**East St. Louis, Ill.**, 110 tons, warehouse, to Ingalls Iron Works Co.

**East St. Louis**, 125 tons, building for Lewin Metals Corp., to St. Louis Structural Steel Co.

**Jefferson City, Mo.**, 135 tons, prison buildings at Alcoa Farm, to St. Louis Structural Steel Co.

**State of Missouri**, 2120 tons, Lake-of-the-Ozarks bridge, to Stupp Brothers Bridge & Iron Co.

**Cap au Gris, Mo.**, 1100 tons, lock, to Mississippi Valley Structural Steel Co.

**Wichita, Kan.**, 100 tons, medical building, to Ben Sibbett Iron & Foundry Co., Wichita.

## WESTERN STATES

**Glacier Park, Mont.**, 120 tons, Lee Creek bridge, to American Bridge Co.

**Boulder Dam**, 475 tons, butterfly valves, to Hardie-Tynes Mfg. Co.

**Rangeville, Idaho**, 310 tons, State highway bridge, to Kansas City Structural Steel Co.

**Bennett, Colo.**, 300 tons, bridge, to Virginia Bridge & Iron Co.

**Byers, Colo.**, 150 tons, bridge, to Minneapolis-Moline Power Implement Co.

**Paonia, Colo.**, 225 tons, bridge, to American Bridge Co.

**Los Angeles**, 750 tons, White Point out-fall sewer, to Consolidated Steel Corp.

**Los Angeles**, 100 tons, telescoping forms for Metropolitan Water District, to Pacific Iron & Steel Co.

## NEW STRUCTURAL STEEL PROJECTS NORTH ATLANTIC STATES

**New York**, 1000 tons, Tri-borough bridge, contract No. 47; bids Oct. 10.

**Brooklyn**, 410 tons, extensions to buildings 11 and 12, Brooklyn Navy Yard.

**Baltimore & Ohio Railroad**, 510 tons, grade crossing elimination at Stapleton, Staten Island, N. Y.

**State of New York**, 460 tons, highway bridges.

**Buffalo**, 2000 tons, Federal court building; bids Oct. 18.

**Northumberland-Union Counties, Pa.**, 100 tons, resurfacing bridge floor; bids Oct. 4.

**Centre-Clinton Counties, Pa.**, 200 tons, bridge; bids Oct. 4.

**State of Pennsylvania**, 180 tons, highway bridge in McKean County.

## THE SOUTH

**Norris, Tenn.**, 275 tons, sub-station at Norris Dam for Tennessee Valley Authority.

**Pickwick Landing, Tenn.**, 560 tons, dam for Tennessee Valley Authority.

**Southern Pacific Co.**, 500 tons, bridge over Nueces River, Tex.

**Dallas, Tex.**, 225 tons, exhibition building.

**State of Texas**, 325 tons, bridges.

## CENTRAL STATES

**Monroeville, Ohio**, 260 tons, including 75 tons reinforcing bars, State highway bridge and grade crossing elimination for New York Central and Wheeling & Lake Erie Railroad; bids Sept. 27 and Oct. 1.

**Columbus, Ohio**, 317 tons, building for Automatic Reclosing Circuit Breaker Co.

**Cairo, Ill.**, 575 tons, levee.

**Gary, Ind.**, 900 tons, cranes for American Sheet & Tin Plate Co.

**Fort Wayne, Ind.**, 600 tons, plant for International Harvester Co.

**State of Iowa**, 200 tons, bridges.

**State of Wisconsin**, 200 tons, bridges; bids close Oct. 8.

**St. Louis**, 150 tons, Southwest high school; bids Oct. 2.

## WESTERN STATES

**Fort Peck, Mont.**, 500 tons, cableway towers; bids soon.

**Grand Coulee Dam, Wash.**, 700 tons, braces for coffer dams; new bids soon.

**Bonneville Dam, Ore.**, 391 tons, superstructure for power house; bids Oct. 8.

## FABRICATED PLATES

### AWARDS

**New York**, 150 tons, two tanks and derrick barge for Standard Dredging Co., to Paterson Boiler & Tank Co., Inc.

**New York**, 200 tons, about 100 small tanks for Permutit Co. for use throughout Pennsylvania, to Paterson Boiler & Tank, Inc.

**Evansville, Ind.**, 125 tons, tank for Gulf Refining Co., to Graver Tank & Mfg. Co.

**Milwaukee**, 2100 tons, oil refinery requirements for Standard Oil Co. of Indiana, Wilshire Oil Co. and Asiatic Petroleum Co., to A. O. Smith Corp.

**Wichita, Kan.**, 225 tons, 40 tank cars for Standard Oil Co. of Kansas, to Petroleum Iron Works.

**Los Angeles**, 500 tons, water stops for Metropolitan Water District, to Consolidated Steel Corp.

**Boulder Dam, Nev.**, 560 tons, four roller gates for Bureau of Reclamation, to Dravo Construction Co.

## NEW PROJECTS

**Kansas City, Mo.**, 411 tons, dredge pipe for United States Engineers' office; McClintic-Marshall Corp. low bidder.

**Los Angeles**, 25.09 miles of 12 and 13-ft. pipe for Metropolitan Water District, Specification 115, alternates on welded steel pipe or reinforced concrete; bids Oct. 24.

**Oakland, Cal.**, 1700 tons, 20 and 24-in. pipe for East Bay Municipal Utility District; Steel Tank & Pipe Co. low bidder.

## SHEET PILING

### AWARDS

**Cowlitz County, Wash.**, 125 tons, Toutle River bridge, to Pacific Coast Steel Corp.

## NEW PROJECTS

**Cap au Gris, Mo.**, 114,000 sq. ft., lock No. 25 in Mississippi River; United Construction Co., Winona, Minn., low bidder on general contract.

**Government Island, Cal.**, 3000 tons, bulkhead for United States Coast Guard, Ben C. Gerwick, general contractor.

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# Lead and Spelter Are \$3 a Ton Higher; Copper Quiet Following Price Rise

Largest Lead Shipments Since April Result in 3300 Ton Stock Reduction—  
Tin Prices Weaker As Demand Continues Dull

**N**EW YORK, Sept. 24.—Copper buying has been considerably less active since the 9c. price went into effect, but a fair amount of business continues to occupy the market. Sales last week averaged about 1000 tons daily, and were 977 tons yesterday. Total bookings for the month to date are approximately 82,000 tons.

## Zinc

Following a period of considerable activity, zinc prices were advanced on Sept. 17 to 4.75c. a lb., East St. Louis, and 5.12½c., New York. Heavy anticipatory buying preceded this rise, but subsequent demand has noticeably weakened.

The recent spurt was sufficient to increase unshipped orders on producers' books by 16,107 tons. As a result, some sellers doubt whether the newly established price levels can be maintained. Sales last week of 20,000 tons included about 2000 tons at the higher prices. Specifications have mainly been for fourth quarter delivery, but some bookings have been made for delivery in 1936. Increased galvanizing operations have figured in demand.

## Tin

The market was a shade more active last week than during the

preceding period but such business as was placed, was not essentially sound. The action of tin plate producers in asking for postponement of deliveries brought about a situation by which sellers were forced to buy back metal already contracted for and attempt to market it elsewhere. Thus, the pressure on spot metal in New York became so acute that tin producers found it more profitable to ship abroad. Accordingly nominal amounts of the refined metal were exported. Domestic warehouses now have on hand about 350 tons, whereas in the United Kingdom stocks amount to approximately 836 tons. This means that the shortage abroad is counterbalanced by an excess of metal here. Standard tin was quoted in London this morning at £224 15s. for spot and £213 10s. for futures, while the price in the East was £221. Straits metal at New York was available at 48.75c. a lb., off slightly from one week ago.

## Lead

The expected advance in prices was announced on Sept. 19, when the American Smelting & Refining Co. boosted its quotations \$3 a ton to 4.35c. a lb., St. Louis, and 4.50c., New York. St. Joseph Lead Co., which had raised its Eastern quotation \$1 a ton the day before, followed the advance and continues to ask its five-point premium on business in the East. Although some slackening in demand occurred as a consequence of higher prices, the market still continues active, with tin foil, battery and paint makers taking large amounts of metal. August statistics were bullish. Shipments of 38,195 tons were the best of any month this year except in April when they were abnormally large because of impending freight rate increases. For the first eight months of 1935, shipments have averaged 33,525 tons monthly, compared with only 30,175 in the corresponding 1934 period. August production was 34,856 tons, and stocks at the end of the month stood at 227,583 tons, against 230,915 tons a month earlier, a decrease of 3332 tons.

## Ingot Brass and Bronze

The Non-Ferrous Ingot Metal Institute reports that in the 28-day period ended Sept. 6, the average prices paid for commercial 80-10-10 and commercial 85-5-5-5 brass ingots were 9.375c. a lb. and 7.925c. a lb., respectively. In the four weeks ended Aug. 9, the corresponding figures were 9.306c. a lb. and 7.775c. a lb. The institute also reports that combined deliveries of brass and bronze ingots by its members amounted to 5297 tons during August, compared with 4507 tons in July.

## The Week's Prices. Cents Per Pound for Early Delivery

	Sept. 18	Sept. 19	Sept. 20	Sept. 21	Sept. 23	Sept. 24
Electrolytic copper, N. Y.*	8.75	8.75	8.75	8.75	8.75	8.75
Lake copper, N. Y.	9.12½	9.12½	9.12½	9.12½	9.12½	9.12½
Straits tin, spot, New York	49.25	49.20	49.00	48.75	48.75	48.75
Zinc, East St. Louis	4.75	4.75	4.75	4.75	4.75	4.75
Zinc, New York†	5.12½	5.12½	5.12½	5.12½	5.12½	5.12½
Lead, St. Louis	4.20	4.35	4.35	4.35	4.35	4.35
Lead, New York	4.35	4.50	4.50	4.50	4.50	4.50

\*Refinery quotations; price ¼c. higher delivered in Connecticut.

†Includes emergency freight charge.

Aluminum, virgin 99 per cent plus, 19c. to 21c. a lb., delivered.

Aluminum, No. 12 remelt, No. 2 standard, in carloads, 16.50c. a lb. delivered.

Nickel, electrolytic, 35c. to 36c. a lb. base refinery, in lots of 2 tons or more.

Antimony, Asiatic, 13.50c. a lb., New York.

Quicksilver, \$69 to \$71 per flask.

Brass ingots, commercial 85-5-5-5, 8.50c. a lb., delivered; in Middle West ¼c. a lb. is added on orders for less than 40,000 lb.

## From New York Warehouse

### Delivered Prices, Base per Lb.

Tin, Straits pig	49.75c. to 50.75c.
Tin, bar	51.75c. to 52.75c.
Copper, Lake	10.00c. to 11.00c.
Copper, electrolytic	10.00c. to 11.00c.
Copper, castings	9.75c. to 10.75c.
*Copper sheets, hot-rolled	16.00c.
*High brass sheets	14.37½c.
*Seamless brass tubes	16.37½c.
*Seamless copper tubes	16.50c.
*Brass rods	12.87½c.
Zinc, slabs	5.75c. to 6.75c.
Zinc, sheets (No. 9), casks, 1200 lb. and over	10.25c.
Lead, American pig	4.85c. to 5.85c.
Lead, bar	5.85c. to 6.85c.
Lead, sheets	8.25c.
Antimony, Asiatic	14.50c. to 15.50c.
Alum., virgin, 99 per cent, plus	23.20c.
Alum., No. 1 for remelting, 93 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ⅓	30.00c. to 31.00c.
Babbitt metal, commercial grades	25.00c. to 60.00c.

\*These prices are also for delivery from Chicago and Cleveland warehouses.

## From Cleveland Warehouse

### Delivered Prices per Lb.

Tin, Straits pig	53.75c.
Tin, bar	55.75c.

Copper, Lake	10.00c.
Copper, electrolytic	10.00c.
Copper, castings	9.75c.
Zinc, slabs	6.25c. to 6.50c.
Lead, American pig	5.10c. to 5.40c.
Lead, bar	8.50c.
Antimony, Asiatic	16.00c.
Babbitt metal, medium grade	19.25c.
Babbitt metal, high grade	57.75c.
Solder, ½ and ⅓	31.25c.

## Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	6.62½c.	7.37½c.
Copper, hvy. and wire	6.50c.	7.00c.
Copper, light and bottoms	5.50c.	6.00c.
Brass, heavy	3.62½c.	4.25c.
Brass, light	2.87½c.	3.62½c.
Hvy. machine composition	5.75c.	6.25c.
No. 1 yel. brass turnings	4.87½c.	5.37½c.
No. 1 red brass or compos. turnings	5.25c.	5.75c.
Lead, heavy	3.37½c.	3.75c.
Zinc	2.37½c.	2.75c.
Cast aluminum	12.12½c.	13.25c.
Sheet aluminum	13.25c.	14.75c.



## Pipe Lines

A group of municipalities in lower peninsula district of Michigan, headed by William Shakespeare, mayor of Kalamazoo, Mich., are completing plans for joint construction of new welded steel pipe line from natural gas field in central Michigan for commercial gas supply for 12 or more communities. Main line will have connecting lateral steel pipe lines to different cities and towns, where distributing lines will be installed. A number of independent oil and gas producers are interested in project and will provide sources of supply. Entire project will cost about \$10,000,000 and financing will be carried out through Federal aid. Robert C. Weber, mayor of Saginaw, Mich., and Lynd A. Walking, secretary, Michigan Better Government Committee, East Lansing, Mich., are active in project, in addition to Mayor Shakespeare.

Blytheville, Ark., plans steel pipe lines for natural gas distribution. Cost about \$220,000. Financing is being arranged through Federal aid.

Pacific Gas & Electric Co., San Francisco, plans new welded steel pipe line from natural gas properties of Amerasia Petroleum Corp., near Tracy, Cal., where contract has been made for gas supply, to connection with present Pacific Gas main trunk line in that vicinity, about 70 miles from San Francisco.

United States Engineer Office, Missouri River Division, Kansas City, Mo., asks bids until Sept. 30 for 34 28-in. welded pontoon pipes; 360 28-in. welded land pipes; and 20 28-in. welded pipes, all 20-ft. lengths (Circular 16).

Oklahoma Natural Gas Co., Oklahoma City, Okla., plans new 6-in. welded steel pipe line from Oklahoma City to point near Edward, Okla., for gas supply. Cost over \$50,000.

Lubbock, Tex., has called special election Oct. 3 to approve bonds for \$1,200,000 for steel pipe line system for natural gas supply, including distributing station and operating facilities.

Standard Pipe Line Co., a subsidiary of Standard Oil Co. of California, 225 Bush Street, San Francisco, plans 12-in. submarine steel pipe line from sea end of present 18-in. line to wharf of parent company, near Morro, Cal., about 2600 ft.; also for 8-in. submarine steel pipe line from sea end of present 16-in. line to wharf of parent company noted, about 1850 ft. distant, for oil service.

## This Week on the Assembly Line

(CONTINUED FROM PAGE 145)


that the local mill is to supply part of the fourth quarter hot-rolled strip requirements to A. O. Smith Corp., at Milwaukee for Chrysler frames. It is understood that in this particular case Chrysler insisted that tonnage be purchased locally, although the buying was done by A. O. Smith. There is much discussion as to whether this transaction means that Chrysler will bring more pressure on suppliers than in the past to buy steel from mills designated by it. There is no likelihood, however, that Chrysler will follow in Ford's footsteps and do the buying of steel for its major sources.

Steel shipments to the automotive industry are increasing slowly in volume. Chevrolet and Chrysler, as they usually do, are laying in stocks of forging steel prior to the close of Lake navigation

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While the labor situation is relatively quiet, the industry is taking no chances on getting caught short of stock. Chevrolet, for instance, is reputed to have close to 300,000 transmissions built ahead and in other individual cases stocks of parts are being accumulated as a reserve supply in case any trouble might arise. Chevrolet's new building at Saginaw is completed and new machinery will be moved in shortly. Contrary to the general opinion that Chevrolet will ease itself out of Toledo, it is now erecting an addition to its transmission plant there. It is reported that only Standard and truck transmissions can be made at Muncie, so that Toledo will continue a major source even when the Saginaw plant is running smoothly.

Reports that Electric Auto-Lite Co. is moving some of its operations out of Toledo are ill-founded. It is expanding its operations at plants outside Toledo because of increased volume of business, but all the work which has been done at its main factory is still centered there. Its subsidiary at Port Huron, the American Enameled Magnet Wire Co., is not equipped to build the products now made at Toledo. This disposes of stories that the company is transferring some of its operations from Toledo to Port Huron.

Packard, winding up a meeting of dealers and distributors with a driveaway of 1700 of its 1936 models from the local factory, has announced that it expects to build

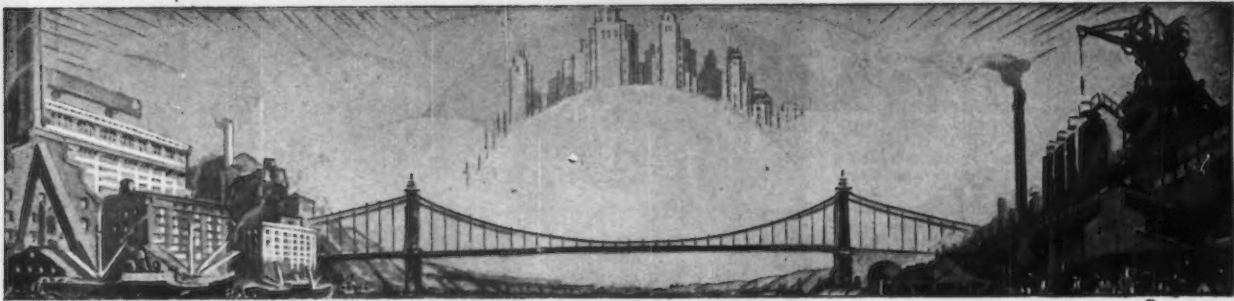
70,000 of its 120 models and 9,000 of its larger cars during the twelve months beginning Oct. 1.

In an effort to cut down die costs for independent companies, it is understood that Hayes Body Corp. has arranged to make the same body stampings and assemble the same bodies for the higher-price Graham car as for Reo. The trimmings on these bodies will differ, of course, so that the finished products will not resemble each other in the public's eyes.

### Detroit Notes

Flint citizens are giving a testimonial dinner to Harlow H. Curtice, Buick's president, Wednesday evening, in appreciation of his rehabilitation of Buick. . . . Reo has received two more Federal government orders, one for 162 trucks and the other for 49. . . . Oldsmobile's assembly line started last week. Four thousand men were kept at work by Olds and Fisher at Lansing during the change-over period. . . . Pontiac has completely revamped its connecting rod department and is understood to have established a centralized inspection department.

The Navy Department will open bids Oct. 2 for a light cruiser which is to be built in a private yard. The department readvertised for bids on this vessel when original figures were submitted and were held to be too high. Awards were made at that time on other ships included in the naval program.



## Plant Expansion and Equipment Buying

### Machine Tool Industry Prepares for Heavy Sales Over Next Six Months

**W**ITH the most successful exposition in its history now a thing of the past, the machine tool industry is settling down to a period of intensive sales effort which is expected to result in heavy orders over a period of at least six months. The interest of buyers in the exhibits at Cleveland developed innumerable sales leads which will be followed aggressively in the next few months.

The amount of machinery sold at the show as indicated by informal commitments which will be followed by formal orders as soon as tooling specifications can be prepared is estimated at \$5,000,000. This, of course, breaks all records for previous machine tool expositions.

#### ◀ NORTH ATLANTIC ▶

**Continental Can Co.**, 1 Pershing Square, New York, will erect a three-story addition, 120 x 220 ft. to plant on South Ashland Avenue, Chicago, for manufacture of tin containers for food products, work to begin within 30 days. Cost about \$1,000,000 with equipment.

**Washburn Wire Co.**, foot of East 118th Street, New York, manufacturer of round and flat steel wire, will soon begin superstructure for one and five-story plant, 201 x 252 ft., on East 117th Street, for which general contract recently was let to John H. Deeves & Brother, 103 Park Avenue. Cost close to \$350,000 with equipment. Bart and John P. Walther, 103 East 125th Street, are architects. Main offices of company are at Phillipsdale, R. I.

**Board of Education**, Park Avenue and Fifty-ninth Street, New York, plans installation of machine shops and other manual training equipment in new four-story Franklin K. Lane high school, Brooklyn, for which bids on general contract will be asked at once. Cost \$3,500,000 including equipment. Manual training departments will also be installed in new four-story Andrew Jackson high school, 115th Avenue and Cross Island Boulevard, Queens, for which bids will soon be asked on general contract. Cost \$2,500,000. Financing has been arranged through Federal aid. W. C. Martin, Flatbush Avenue Extension and Concord Street, Brooklyn, is architect and superintendent for board.

**Ganz Equipment Corp.**, 152 West Forty-second Street, New York, manufacturer of motor buses and equipment, has leased building at Atlantic Avenue and Bedford Place, Brooklyn, about 4000 sq. ft. floor space, for new assembling works.

**Purchasing and Contracting Officer**, Medical Section, Army Base, Brooklyn, asks bids until Oct. 14 for electric centrifuges, distilling equipment, cylinders, condensers and other equipment (Circular 21).

**Bagpak, Inc.**, 220 East Forty-second Street, New York, manufacturer of heavy

paper bags for cement, plaster, etc., a subsidiary of International Paper Co., has plans for new works in Cullendale district, Camden, Ark., near mill of Southern Kraft Corp., an affiliated interest. It will be one-story, 110 x 300 ft. Cost over \$100,000 with machinery.

**Construction Quartermaster**, United States Military Academy, West Point, N. Y., plans extensions and improvements in power plant at institution. Cost about \$160,000 with equipment. Plans are also under way for new ordnance and engineering laboratories to cost \$300,000 with equipment; group of automobile service, repair and garage buildings, cost \$125,000 with equipment; and extensions and improvements in water system, including new pipe lines, etc., to cost about \$125,000. Appropriations are being arranged.

**New Jersey Metals Corp.**, 690 Market Street, Newark, N. J., has acquired foundry of General Electric Co., Rockefeller Street, Elizabeth, N. J., and will improve for new plant. Present works will be removed to new location later.

**United States Playing Card Co.**, Park Avenue, Cincinnati, has asked bids on general contract for new one-story branch converting and manufacturing plant, 150 x 350 ft., at New Brunswick, N. J. Cost over \$200,000 with machinery. Lockwood Greene Engineers, Inc., 30 Rockefeller Plaza, New York, is architect and engineer.

**Baker & Co., Inc.**, 54 Austin Street, Newark, N. J., manufacturer of platinum and other precious metal products, has leased about 7200 sq. ft. floor space in building at 512 King Street East, Toronto, Ont., for branch plant for Canadian market. New subsidiary has been organized under name of Baker Platinum of Canada, Ltd., to operate plant. A. Burton Strange, Jr., will be local manager and will supervise plant installation.

**Bureau of Supplies and Accounts**, Navy Department, Washington, asks bids until Oct. 4 for 400 high-speed steel counter-sinks (Schedule 6048); until Oct. 15 for

700 power-driven fuel pumps (Schedule 6055), for Philadelphia Navy Yard.

**Quartermaster Depot**, Twenty-first and Johnston Streets, Philadelphia, asks bids until Oct. 14 for air-conditioning equipment (Circular 64).

**Louis Schwab**, secretary and treasurer, Girard Smelting & Refining Co., Philadelphia, and Herman Ladenson, president, Ladenson Metals Corp., Philadelphia, will head Franklin Smelting & Refining Co., which will occupy modern plant covering three acres at Castor Avenue east of Richmond Street, Philadelphia. Plant will have annual capacity of 50,000,000 lb. of finished copper, zinc, lead, antimony lead, aluminum, brass and bronze ingots, solder, babbitt and special alloys. Company will also engage in preparation of scrap for direct use by foundries, rolling mills, etc.

**Westchester County Park Commission**, White Plains, N. Y., plans new county airport at Croton Point, including group of hangars, with shop and reconditioning facilities, oil storage and distributing building and other field units. Fund of \$2,500,000 is being arranged through Federal aid.

**Board of Education**, Chester, N. Y., plans manual training department in new two-story school. Cost about \$160,000. Financing is being arranged through Federal aid. R. R. Graham, 25 Prospect Street, Middletown, N. Y., is architect. Elwyn E. Seelye & Co., 101 Park Avenue, New York, are consulting engineers.

**Hoffman Beverage Co.**, 402 Grove Street, Newark, N. J., has purchased two-story factory at 25-33 Whitney Street, totaling about 10,000 sq. ft. floor space, for expansion.

#### ◀ NEW ENGLAND ▶

**Board of Education**, Springfield, Mass., plans new multi-unit trade school on about 15 acre tract in Blunt Park district. Cost \$940,000 with equipment. Financing is being arranged through Federal aid. Frank W. S. King, 33 Lyman Street, is architect.

**United States Rubber Co.**, Potter Street, Cambridge, Mass., plans rebuilding portion of storage and distributing plant at Chelsea, recently destroyed by fire. Loss over \$50,000 with equipment.

**Connecticut Light & Power Co.**, East Main Street, Milford, Conn., has let general contract to United Engineers & Constructors, Inc., 1401 Arch Street, Philadelphia, for new one and one-half story mechanical shop with storage facilities, 45 x 80 ft. Cost close to \$40,000 with equipment.

**School Board**, Fitchburg, Mass., plans manual training department in new multi-story high school on Academy Street, to replace a structure destroyed by fire several months ago, for which bids will be asked soon on general contract. Cost about \$900,000 with equipment. Coolidge, Shepley, Bulfinch & Abbott, 1 Court Street, Boston, are architects; H. M. Francis & Sons, 904 Main Street, Fitchburg, are associate architects.

**Metropolitan Coal Co.**, 20 Exchange Place, Boston, plans addition to storage





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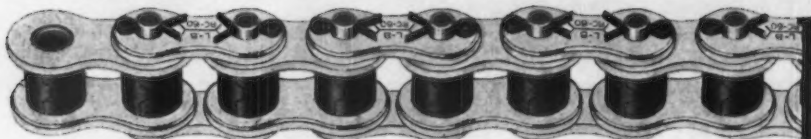
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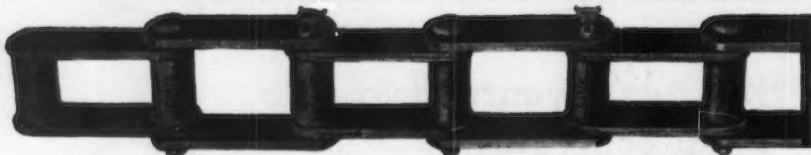
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and distributing plant at Chelsea, with installation of conveying, loading and other mechanical equipment. Cost about \$175,000 with machinery.

### ◀ OHIO AND INDIANA ▶

Duriron Co., Inc., 450 North Findlay Street, Dayton, Ohio, will ask bids soon on general contract for new one-story foundry, 60 x 70 ft. Cost over \$35,000 with equipment. Geyer & Neuffer, Ludlow Arcade Building, are architects.

John G. Lincoln and Homer Meaner, Cleveland, both formerly connected with Lincoln Electric Co., 12818 Coit Street, have organized a company to manufacture

steel fabricated products, tanks, etc., and operate a general welding works. Lease has been taken on one-story building at 3005 East Fifty-fifth Street, on site 88 x 115 ft., previously occupied by Glantz Brass & Aluminum Foundry Co., and will be used for new plant. Equipment will be installed at once. New company will be headed by Mr. Lincoln as president, and Mr. Meaner, vice-president.

Lynchburg Distillery Co., Lynchburg, Ohio, has awarded general contract to Eugene Carlier, Fayetteville, Ohio, for remodeling local building for a distilling plant. Cost over \$75,000 with equipment. Carl J. Kiefer, Schmidt Building, Cincinnati, is consulting engineer.

Cleveland & Sandusky Brewing Co., 2764 East Fifty-fifth Street, Cleveland, plans

multi-story addition to brewing plant. Cost over \$50,000 with equipment.

Reliable Pattern & Castings Co., 2822 Spring Grove Avenue, Cincinnati, manufacturer of iron castings, etc., has acquired one-story building, 60 x 200 ft., at 3530 Spring Grove Avenue, and adjoining site, 40 x 200 ft., for future extensions. Structure will be remodeled for early occupancy for main plant, with removal of present works to new location and expansion in capacity.

Contracting Officer, Material Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until Oct. 1 for one single-stage vacuum pump (Circular 202); until Oct. 2, one ground speed and drift meter (Circular 197); until Oct. 3, 20 radiator shutter control assemblies (Circular 200); until Oct. 4, one motor-driven band, scroll and resaw saw, one motor-driven wood shaper and wood surfacer (Circular 196); until Oct. 7, five basket assemblies (Circular 194); until Oct. 11, 1625 bomb release handle assemblies and 900 flare rack assemblies (Circular 198).

James Walsh Distilling Co., Lawrenceburg, Ind., has asked bids on general contract for two-story addition for storage and distribution. Cost over \$70,000 with equipment.

Chicago Telephone Supply Co., Elkhart, Ind., manufacturer of telephone equipment and other electrical specialties, has let general contract to Ira Mast, Elkhart, for one-story top addition, 60 x 120 ft. Cost over \$45,000 with equipment.

Board of Public Service, East Liverpool, Ohio, E. B. Laughlin, Service-Safety Director, has been authorized by City Council to arrange Federal financing for \$1,500,000 for municipal electric light and power plant, and electrical distribution lines, for which plans will soon be drawn.

### ◀ BUFFALO DISTRICT ▶

City Council, Jamestown, N. Y., plans new municipal airport on North Main Street, where 218 acres is being acquired, including hangars, repair and reconditioning shops, oil storage and distributing buildings, and other field units. Cost about \$315,000. Financing is being arranged through Federal aid.

Buffalo Envelope Co., 268-70 Michigan Avenue, Buffalo, plans three-story addition to paper converting plant, 60 x 100 ft. Cost over \$65,000 with equipment. Albert H. Hopkins, Liberty Bank Building, is architect.

Franklin Automobile Co., 302 South Geddes Street, Syracuse, N. Y., organized several months ago to take over plant and business of H. H. Franklin Mfg. Co., bankrupt, is arranging for early operations for manufacture of new eight-cylinder air-cooled automobile, including parts production and assembling. A new division will be established for manufacture of air-cooled and air-conditioned refrigerating equipment. John E. Williams is president; Dallas E. Winslow, head of Copeland Refrigeration Corp., 1331 Holden Street, Detroit, has recently been elected chairman of board and treasurer, and will be active in company.

### ◀ MIDDLE WEST ▶

International Harvester Co. of America, Inc., 606 South Michigan Avenue, Chicago, will soon take bids on general contract for addition to motor truck manufacturing works at Springfield, Ohio, one and two-stories, 165 x 638 ft. Cost about \$600,000 with equipment. Bids will be asked also for new power plant at same works, to cost about \$150,000 with equipment. W. L. Dunn is company engineer at Springfield; W. H. Kruger is engineer, Chicago. Plans are nearing completion for first of several units to be erected at agricultural equipment plant at East Moline, Ill., one-story, 111 x 352 ft., with power house, 50 x 50 ft. A traveling crane will be installed. Cost over \$500,000 with equipment. E. W. Stahl is superintendent at works. Company has filed plans for one and two-story addition, 80 x 233 ft., at 2600 West Thirty-first Street, Chicago, for which general contract recently was let to R. H. Burkhardt, Chicago. Cost over \$175,000 with equipment.

Sundstrand Machine Tool Co., 2531 Eleventh Street, Rockford, Ill., has let



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general contract to Linden & Sons, 432 London Street, for one-story addition, 40 x 45 ft. Cost about \$30,000 with equipment. Peterson & Johnson, Swedish-American Bank Building, are architects.

United States Engineer Office, St. Paul, Minn., asks bids until Oct. 10 for equipment for lock and dam No. 8, Mississippi River, including hand-operated traveling bridge crane, two electric tow-haulage units with accessories, gasoline-electric standby power units, lock lighting system equipment, transformers, regulators, dam conduit system, dam power feeder lines, etc. (Circular 53).

City Council, St. Cloud, Minn., plans new municipal electric light and power plant, using Diesel engine-generator units. Cost about \$140,000. Financing is being arranged through Federal aid. Burns & McDonnell Engineering Co., 107 West Linwood Boule-

vard, Kansas City, Mo., is consulting engineer.

Gering Valley Rural Public Power District, Gering, L. H. Sloan, vice-president, recently formed, plans new rural electrification project, totaling about 68 miles of transmission and distributing lines, with power substation and service facilities. Cost close to \$100,000 with equipment. Financing is being arranged through Federal aid.

Crowe Name Plate & Mfg. Co., 1749 Grace Street, Chicago, manufacturer of decorative metal parts, automotive panels, dials, name plates, radio control units and parts, is erecting a one-story addition, 107 x 150 ft. Cost about \$65,000 with equipment.

Marathon County, Wis., has plans by Oppenheimer & Obel, architects, Wausau

and Green Bay, Wis., for machine shop and garage for county highway department, 70 x 300 ft., one-story, with boiler room, 29 x 70 ft., to cost about \$80,000 with equipment. J. A. Clark, Wausau, is county highway commissioner.

Hibbard, Spencer, Bartlett & Co., 211 East North Water Street, Chicago, hardware products and kindred mechanical equipment, have let general contract to Gerhardt F. Meyne Co., 7 North Dearborn Street, for extensions and improvements in storage and distributing building, including new mezzanine floor, 100 x 120 ft. Cost about \$30,000.

Independent School District No. 40, Harmony, Minn., plans manual training department in new two-story senior and junior high school. Cost about \$125,000. Financing is being arranged through Federal aid. Croft & Boerner, 1004 Marquette Avenue, Minneapolis, Minn., are architects.

## ◀ SOUTH CENTRAL ▶

Plough, Inc., Memphis, Tenn., manufacturer of industrial and other chemicals, has asked bids on general contract on revised plans for new multi-story plant, totaling 150,000 sq. ft. floor space. Cost close to \$450,000 with equipment. Harker & Cairns, 123 South Court Street, are architects. Arthur L. Nelson Engineers, Inc., 31 St. James Avenue, Boston, is engineer.

Armour & Co., Chattanooga, Tenn., headquarters at Chicago, have begun expansion and improvements in plant at Chattanooga, for lard and kindred production, to include new equipment. Cost over \$200,000 with machinery.

Board of Port Commissioners, New Orleans, asks bids until Oct. 11 for 50,000-gal. steel water tank for warehouse unit at Poland and Dauphine Streets.

City Council, Danville, Ky., plans new municipal electric light and power plant, including distribution lines. Cost about \$350,000 with equipment. Financing is being arranged through Federal aid. City engineer in charge.

City Council, Knoxville, Tenn., is securing about 350 acres in Blount County, about eight miles from city, for new municipal airport, to include hangars, with repair and reconditioning facilities, oil storage and distributing buildings and other field units. Cost about \$400,000. Financing is being arranged.

## ◀ WASHINGTON DIST. ▶

Purchasing Officer, Department of Interior, Washington, asks bids until Sept. 30 for 15 air hammers, with 50-ft. sections air hose, couplings, etc. (Proposal 985), velocity-type governors (Proposal 977), portable quarry-type rock-crushing plants (Proposal 929); until Oct. 1, five truck shovels and one truck dragline (Proposal 989), seven gasoline-powered shovels and one gasoline-powered dragline (Proposal 997).

Purchasing and Contracting Officer, Holabird Quartermaster Depot, Baltimore, asks bids until Oct. 1 for 40 governors for motor trucks (Circular 42).

Virginia Electric & Power Co., Richmond, Va., plans addition to steam-operated electric generating plant, including installation of new 12,500-kw. turbo-generator and auxiliary equipment, high-pressure boiler units, pumps and other equipment. Cost about \$2,000,000.

General Purchasing Officer, Panama Canal, Washington, asks bids until Oct. 7 for 23,500 machine bolts, 54,000 carriage bolts, brass bolts, nuts, washers, steel rivets, expansion shields, barrel bolts, air sprayers, 40,000 ft. No. 10 wire, magnet wire, copper cable, 14 transformers, one stereotypic casting equipment, steel shelving and other supplies (Schedule 3092).

Maryland Club Distilling Corp., 642-46 West Pratt Street, Baltimore, has taken over building at location noted, recently leased, for new distilling plant and will install equipment at once. M. B. Jasspon is president.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Oct. 1 for two motor-driven turret lathes and equipment (Schedule 6022); until Oct.





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THE IRON AGE, September 26, 1935—183

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8, one motor-driven turret lathe and equipment (Schedule 6035), for Norfolk Navy Yard; until Oct. 1, are welding transformer (Schedule 5959); until Oct. 11, cartridge case supports (Schedule 6023), for Eastern and Western yards; until Oct. 4, strut assemblies for wheel type tail skid on airplanes (Schedule 900-8780); until Oct. 8, 32 submersible portable pumps, electric-operated, capacity 130 gal. per min. (Schedule 6037), for Sewall's Point Navy Yard.

City Council, Roanoke, Va., has plans for new municipal incinerator, including furnaces and other power equipment, loaders, conveyors and other mechanical equipment. Fund of \$112,000 is being arranged through Federal aid for building and machinery.

## ◀ WESTERN PA. DIST. ▶

Climax Molybdenum Co., Union Trust Building, Pittsburgh, has plans for extensions in mining properties at Climax, Colo., to include new mining machinery, hoisting, loading and other equipment. Cost about \$300,000 with equipment. Company will also carry out a housing development for employees at mines to cost over \$100,000.

Pennsylvania Coal Products Co., Petrolia, near Butler, Pa., plans rebuilding part of extension plant recently destroyed by fire. Loss about \$50,000 with equipment.

Old Tavern Brewing Co., Fairmont, W. Va., has acquired former plant of Clarksburg Brewing Co., Clarksburg, W. Va., and will improve for new branch plant. Cost about \$80,000 with machinery.

City Council, New Castle, Pa., has voted to arrange Federal financing in amount of \$1,500,000 for new municipal electric light and power plant, including electrical distributing lines, for which plans will soon be drawn.

## ◀ SOUTH ATLANTIC ▶

Worth Distilling Co., 501 South Spring Street, Greensboro, N. C., plans extensions and improvements, including additional equipment. Cost over \$30,000 with machinery.

City Council, Greenville, S. C., plans new municipal airport near Laurens Road, including hangars with repair and reconditioning facilities and other field units. Fund of \$238,500 is being secured through Federal aid. J. E. Sirrine & Co., Greenville, are architects.

John Barnes Co., Inc., Plant City, Fla., fruit packer, plans new one-story packing plant at Tavares, Fla. Cost about \$60,000 with loading, conveying and other mechanical-handling equipment.

Board of Aiken County Commissioners, Aiken, S. C., plans new hydroelectric generating plant on South Edisto River, with transmission and distributing lines in different parts of county, including power substation facilities. Fund of \$1,700,000 is being arranged through Federal aid. A. E. Yaun is chairman of board, in charge.

Armour & Co., Tifton, Ga., meat packers, plan extensions and improvements in local plant, with installation of new equipment. Cost over \$100,000 with machinery. Headquarters are at Union Stock Yards, Chicago.

## ◀ SOUTHWEST ▶

Mallinckrodt Chemical Works, 3600 North Second Street, St. Louis, has let general contract to James Black Masonry & Contracting Co., Louderman Building, for three-story addition, 56 x 159 ft. Cost close to \$100,000 with equipment. Jamieson & Spearl, Arcade Building, are architects; W. J. Knight & Co., Wainwright Building, are engineers.

Common Council, Ellis, Kan., plans new municipal electric light and power plant and distributing system. Cost about \$80,000. Financing is being arranged through Federal aid. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

Western States Grocery Co., 7 North Detroit Avenue, Tulsa, Okla., with main offices at Vernon, Los Angeles, has let general contract to W. K. Grimshaw Co., Philcade Building, Tulsa, for new two-story and basement two-unit storage and distributing plant, to occupy two blocks. Cost \$450,000 with mechanical-handling, conveying, and other equipment. Joseph R. Koberling, 569 South Peoria Street, Tulsa, is architect.

Board of Education, Chanute, Kan., plans new two-story manual training and trade school. Cost about \$125,000 with equipment. Financing is being arranged through Federal aid. D. B. Peterson, 721 Minnesota Avenue, Kansas City, Kan., is architect.

City Commission, Ponca City, Okla., plans extensions and improvements in municipal electric light and power plant, including new 2000-kw. turbo-generator unit and accessory equipment. Cost about \$175,000. Financing is being arranged through Federal aid.

City Council, Weimar, Tex., asks bids until Sept. 30 for deep-well turbine pumping machinery, centrifugal pumping units and accessories, pipe lines, etc., for municipal waterworks. Brandon Fitzpatrick and Emil Fahrenthold, Weimar, are engineers.

Lone Star Gas Co., Dallas, Tex., plans new gasoline refinery on 30-acre tract near Trinidad, Tex. Cost about \$225,000 with equipment.

Grand River Dam Authority, Oklahoma City, Okla., care of J. Howard Langley, Pryor, Okla., chairman, has applied to PWA for Federal loan and grant for \$15,997,000 for hydroelectric power project in Mayes County, including power dam and generating station on Grand River, near Pensacola, Okla., transmission and distributing lines, with power substation and service facilities. Portion of fund will be used for floor control construction. J. M. Maurer, Oklahoma City, is consulting engineer.

## ◀ MICHIGAN DISTRICT ▶

Ferro Stamping Mfg. Co., 1367 Franklin Street, Detroit, has let general contract to Bryant & Detwiler Co., Penobscot Building, for new one-story plant, with power house adjoining. Cost over \$50,000 with equipment. Giffels & Vallet, Inc., Marquette Building, is architect and engineer.

Willcox-Rich Corp., 9771 French Road, Detroit, manufacturer of piston rings, valves and kindred automotive equipment, has let general contract to Fred Trier Construction Co., Saginaw, Mich., for two-story addition to plant at Saginaw, 90 x 210 ft. Cost over \$75,000 with equipment. George S. Rider Co., Marshall Building, Cleveland, is architect and engineer; Cowles & Mutscheller, Saginaw, are associate architects.

Fisher Body Division, General Motors Corp., General Motors Building, Detroit, has approved plans for addition to plant at Flint, Mich., for production of bodies for local plant of Chevrolet Motor Co., two-stories, about 150 x 250 ft. Cost over \$400,000 with equipment. Chevrolet company will make extensions and improvements in power plant for service in new Fisher plant unit and other purposes. Cost over \$75,000 with equipment.

Murray Corp. of America, Inc., 1424 Aberle Street, Detroit, manufacturer of automobile bodies, has plans for one-story addition for storage and distribution. Cost over \$40,000 with equipment. Giffels & Vallet, Inc., Marquette Building, is architect and engineer.

Cambell, Wyant & Cannon Foundry Co., Muskegon Heights, Mich., manufacturer of iron castings for automotive service, plans one-story foundry addition. Cost over \$25,000 with equipment.

## ◀ PACIFIC COAST ▶

Republic Supply Co., 2122 East Seventh Street, Los Angeles, mechanical equipment,



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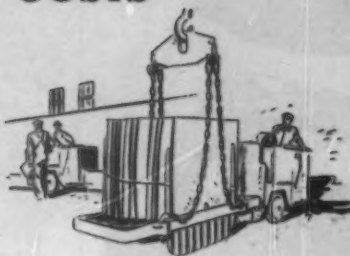
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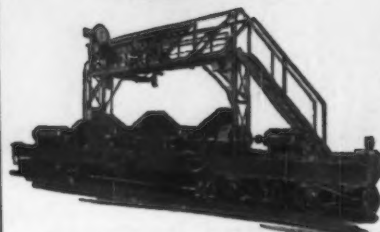
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Special Cars and Electrically Operated Cars for every conceivable purpose.

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Engineers - Manufacturers  
1140 Ivanhoe Rd., Cleveland, O

has let general contract to May & Grimwood, 520 East Eighth Street, for new one-story machine shop, 40 x 60 ft., with foundations for second story later. Cost about \$25,000 with equipment. Henry C. Newton and Robert D. Murray, Architects' Building, are architects.

General Electric Co., Ontario, Cal., has let general contract to Campbell Construction Co., 228 East Transit Street, for one-story foundry, 106 x 168 ft. Cost about \$50,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Oct. 4 for electric cable for arc welding (Schedule 6030); until Oct. 5, one motor-driven automatic chucking turret lathe (Schedule 6033); until Oct. 11, flameproof triplex cable (Schedule 6065), for Mare Island Navy Yard; until Oct. 8, electric heaters for Mare Island and Puget Sound yards (Schedule 6039).

Northwest Bolt & Nut Co., 4518 Fourteenth Street, N. W., Seattle, plans one-story shop addition, 55 x 65 ft. E. J. White, 2945 First Street, South, is engineer.

Los Angeles Board of Education, 1425 South San Pedro Street, Los Angeles, has asked bids on general contract for two new one-story mechanical shop units at Venice high school, Venice Boulevard, 58 x 180 ft., and 58 x 128 ft. respectively. Cost about \$80,000 with equipment. John C. Austin and Frederic M. Ashley, Chamber of Commerce Building, Los Angeles, are architects.

B. Cribari & Son, Madrone (Santa Clara County), Cal., has let general contract to John Smith, Madrone, for one-story addition to winery, for fermenting division. Cost about \$35,000 with equipment.

Walter H. Leverett, Medford, Ore., is at head of project to erect a fruit-canning plant, comprising several one-story units, with machine shop, power house and other departments. Cost over \$100,000 with machinery. A company will be organized to carry out enterprise. H. K. Deuel, Medford, is interested in project.

Salem School District, Salem, Ore., plans manual training department in new three-story high school. Cost about \$630,000. Financing is being arranged through Federal aid. Knighton & Howell, United States Bank Building, Portland, are architects.

Arata Packing Co., Fruitland, Idaho, Frank B. Arata, head, has plans for rebuilding part of fruit-packing plant recently destroyed by fire. Cost close to \$40,000 with equipment.

Board of Education, Palo Alto, Cal., plans manual training department in new three-story junior high school. Cost about \$350,000. Financing is being arranged through Federal aid. Birge M. Clark, 310 University Avenue, is architect.

Libby Fruit Packing Co., 126 South Ninth Street, Phoenix, Ariz., plans new one-story packing plant on 1 1/2-acre tract, totalling about 50,000 sq. ft. floor space. Cost over \$60,000 with conveying, loading and other equipment.

## FOREIGN

London & North Eastern Railway Co., London, England, plans electrification of line from Newcastle to Shields. Company will also modernize its iron ore unloading and distributing plant at Tyne Dock, Tyne River, with installation of hoisting, conveying and other mechanical equipment. Both projects will cost over \$2,000,000 with equipment.

Airport Bureau, Government of Bermuda, Hamilton, Bermuda, B. W. I., plans new commercial airport on large tract, including hangars, repair and reconditioning shops, oil storage and distributing buildings, and other field units. Cost over \$200,000 with equipment.

Ministry of Railways, Government of China, Nanking, China, is arranging fund of 30,000,000 yuan (about \$11,100,000) for construction of section of Chekiang-Kiangso Railway from Nanchang to Ping-siang, including rails and other construction equipment, new rolling stock, locomotive and car repair shops and other mechanical facilities.

Briggs Motor Bodies, Ltd., Dagenham, England, British subsidiary of Briggs Mfg. Co., Detroit, has approved plans for additions, to increase present capacity about 50 per cent. Cost over \$400,000 with

equipment. W. O. Briggs is head of both organizations.

Secretary, Public Works Supplies and Tenders Committee, Wellington, New Zealand, asks bids until Nov. 19 for three 1667-kva. power transformers, oil-immersed, self-cooled type, with accessory equipment for local power station.

Manchester Corp., Manchester, England, operating electric light and power properties, plans extensions and improvements in generating plant on Stuart Street, with installation of new 30,000-kw. turbo-generator and accessories. Company will also carry out expansion at power plant at Barton, with installation of new 50,000-kw. turbo-generator and auxiliaries. Entire project will cost over \$1,500,000.

## TRADE NOTES

General Mfg. Co., Detroit, has appointed Cleveland Duplex Machinery Co., Penton Building, Cleveland, as exclusive representative for sale of General flexible power presses and shaft straightening attachments in northeastern Ohio.

Carbondale Machine Corp., Harrison, N. J., recently reorganized as a subsidiary of Worthington Pump & Machinery Corp., to cover the manufacture and sale of all classes of refrigeration, ice manufacture and air conditioning equipment, has announced the following officers and directors: H. C. Ramsey, president; H. A. Feldbush, vice president; A. H. Baer, vice-president in charge of sales; A. L. Prentice, secretary and treasurer; W. Lehman, assistant secretary and assistant treasurer; F. D. Talmage, assistant secretary and assistant treasurer; C. A. Packard, comptroller.

Titusville Iron Works Co., Titusville, Pa., division of Struthers Wells-Titusville Corp., has secured manufacturing and sales rights for the Master line of scrubbers, separators and mixer heads, except in California.

S. H. Cutts, 36 Yonge Street, Toronto, Ont., has been given agency in Canada for all lines produced by the Peck, Stow & Wilcox Co., Southington, Conn.

Wheelock, Lovejoy & Co., Inc., has removed its Chicago branch to 1834 South Fifty-fourth Avenue, Cicero, Ill.

General Refractories Co., Philadelphia, has appointed Charles A. Strelinger Co., Detroit, as dealer agents in the Detroit area.

Danly Machine Specialties, Inc., 2110 South Fifty-second Avenue, Chicago, manufacturer of all types of standard and special die sets and die makers' supplies, has opened assembly plant and branch office at 3913 North Broad Street, Philadelphia. S. R. Anstey is in charge.

## Trade Publications

Automatic Safety Clutch Co., Inc., 608 South Dearborn Street, Chicago, has issued a four page leaflet describing and listing sizes of its safety overload clutches.

Tap Chart.—R. G. Haskins Co., 4630 West Fulton Street, Chicago. Bulletin listing information on percentages of threads that can be obtained using certain sizes of tap drills.

Foundry Conveyors for steel, malleable, brass and gray iron foundries are described in a new book just issued by the Mathews Conveyor Co., Ellwood City, Pa.

The book contains over fifty pages which are supplemented by eighty illustrations; photographs and line drawing layouts explain up-to-date applications of foundry conveyors.





Have you considered where brass forgings might help solve designing and production problems for you? Here are six up-to-date case histories that prove the value of such analysis.

1. This part is a wing nut . . . originally made as a casting, now made as a brass forging. With a forging they could make a better-appearing part at a cheaper finishing cost, and in that way saved money on over-all production costs.
2. This forging is a pivot for no-draft automobile windows. The manufacturer was using a steel stamping . . . but switched to a forging because he required a rust-proof piece, and greater strength in the part.
3. And again . . . this coil nut for a hot water heater cost less to produce as a forging than as a screw machine part or casting because it could be made to accurate size, and machining time was saved.
4. This is the male half of a hinge used on a steel bank for a steam pressure cooker. This manufacturer had been using a bulky aluminum casting. He switched to a forging, making it with two rivets on the under-side which are riveted through holes in the steel band. A casting similarly made would not rivet as readily. The ultimate cost of the forging also proved to be cheaper. There were fewer rejec-

tions and lower finishing costs since they merely buff the forging and apply the plating without extra cutting down.

5. Here is a cam guide used in a tin can sealer. Formerly a steel piece was used, but the parts had a tendency to stick together as they were both made of steel. After some experimentation, a Revere Brass Forging was chosen rather than a brass casting because the eccentric in this piece had to be accurate, and the machining necessary on a casting would make the final cost higher than for a forging.

6. And lastly, here's a pump seat where a forging saved the manufacturer money. This forging can be made to accurate dimensions, and it provides greater strength in a thinner section.

These specific cases are definite proof of the five primary advantages of Revere Brass Forgings: A. Better metal and less of it. B. Greater strength in a lighter part. C. Accurate and uniform dimensions with consequent economy in machining. D. Smooth surfaces and lower finishing costs. E. Dense uniform structure which has great strength and non-porosity.

To meet the many requirements of industry, Revere has established a Technical Advisory Service . . . through which the facilities of its laboratories and the services of its engineers are offered to any manufacturer with a problem to which copper or one of its alloys may prove the answer.

# Revere Copper *and* Brass

INCORPORATED



EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK CITY • MILLS: BALTIMORE, MD. • TAUNTON, MASS.  
NEW BEDFORD, MASS. • ROME, N. Y. • DETROIT, MICH. • CHICAGO, ILL. • SALES OFFICES IN PRINCIPAL CITIES

THE IRON AGE, September 26, 1935—187

# WELDIT *Gasaver*

**AUTOMATICALLY SHUTS OFF FLAME BETWEEN WELDS**

...*Saving* 25 to 30%  
in Gas and Oxygen



America's largest production plants use Weldit Gasavers. Cuts cost, eliminates idle torch flame hazards, increases production. Price \$10.00. Two weeks trial. Send for circular.

**WELDIT ACETYLENE CO.** 641 BAGLEY AVE. DETROIT, MICH.

**TEST THIS  
WELDIT GASAVER  
FREE FOR TWO WEEKS  
IN YOUR PLANT**

## German Steel Production Still at High Level—Pig Iron Also Active

**H**AMBURG, Sept. 18. (By Special Correspondence.) — Production of steel in Germany during July increased further to 1,447,015 tons, compared with 1,248,800 tons in June, 883,580 tons in July, 1934, 617,458 tons in July, 1933 and only 473,281 tons in July, 1932. This reflects improvement in the German steel market as well as in export trade. Prior to 1935, however, Saar production was not included in the totals. In July, 1935, it was 192,511 tons.

The percentage of Thomas steel in the July total rose to 43.2. August steel output will probably show little change. July production of 23,766 tons of electric steel was the highest for any month since electric steel has been produced in Germany and to this figure 5996 tons of electric steel castings must be added, also a new record.

The steel export market has gained further stimulus from the Belgian draft bill by which the government makes exports of steel impossible except by license of the Cosibel, the Belgian steel cartel. This excludes outsider competition on the steel export market and also "back-door" trading methods of some of the members of the steel cartel.

Poland exported 97,300 tons of finished steel in the first half of

1935, compared with 105,895 tons in the first half of 1934. As this was sold at outsider prices and the Polish industry is now a member of the cartel, the abolishment of competitive prices for markets other than the Scandinavian and Baltic countries is indicated. The probability that Austria, Czechoslovakia and Hungary will also join the international cartel within a short period is of far less importance, as by an agreement in these markets, prices have been at the same level as in other Continental countries.

July pig iron production was 1,092,979 tons, the highest figure since March, 1929. August production is estimated at close to 1,150,000 tons. The number of furnaces active has again increased and is now 98 out of a possible 163. Of these, however, 12 to 15 are obsolete and will probably never go into blast again. Prices for steel scrap have been slightly lowered.

In 1934, 168 factories were closed down and scrapped and 412 new factories were established in Germany. Plants only temporarily closed down are not included. In 1933, 202 factories had been newly established and 172 had been closed. Between 1929 and 1932 the number of closed factories was always higher than that of newly estab-

lished plants and the total loss was more than 1300 industrial enterprises. In 1935, the relation will be still more satisfactory as the number of newly established plants will exceed 500, whereas only some 50 to 60 are expected to go out of business.

The German machinery industry reports a further improvement in operation and is now running at nearly 70 per cent of capacity. This compared with 60.2 per cent in January and 54.3 per cent in July, 1934.

German steel finishing mills are now operating at the following rates of capacity: wire rods, 65 to 68 per cent; thin sheets, 70 to 75 per cent; ship and boiler plates, nearly 100 per cent; all other plates, 80 to 85 per cent; hot-rolled hoops, 75 to 80 per cent; cold-rolled, 85 to 95 per cent; sheet piling, nearly 100 per cent; rails, 70 to 75 per cent; steel bars and rods, 75 to 80 per cent; structural steel, 65 to 70 per cent; tubes, 70 to 75 per cent. Shipping dates are still very extended and if odd sizes are included the makers demand up to 12 weeks. Stocks in hands of the trade are very small.

Production of iron ore was as low as 78,000 tons monthly for all the German provinces in 1932, 105,000 tons in 1933, 195,000 tons in 1934 and is nearly 280,000 tons this year. Business in pig iron is now almost entirely on a barter basis and an interesting example is the trade with Sweden. About 19,900 tons of German foundry iron was exchanged for 6600 tons of charcoal iron plus special steel during the first half of this year. Export freight rates on iron and steel products and all hardware and machinery have been further lowered by the German Railway Co. This is the third reduction in three years and ranges from 4 to 8 per cent, according to the place of shipment. A special rebate has been announced for railroad track material, plates and sheets beginning at 2 per cent up to 10 per cent for annual export quantities of 40,000 to 70,000 tons shipped by one company or by various companies combined in one shipping agency.

Italy continues to buy very heavy quantities of special steel products and also semi-finished steel but is finding it difficult to pay. Italy and Germany have compensation treaties, but the purchases are now higher than reciprocal shipments, so that orders must be slowed down.

A new bar card has recently been issued by the Concrete Reinforcing Steel Institute, 201 North Wells Street, Chicago, which shows areas and weights for the 11 standard sizes of concrete reinforcing bars.

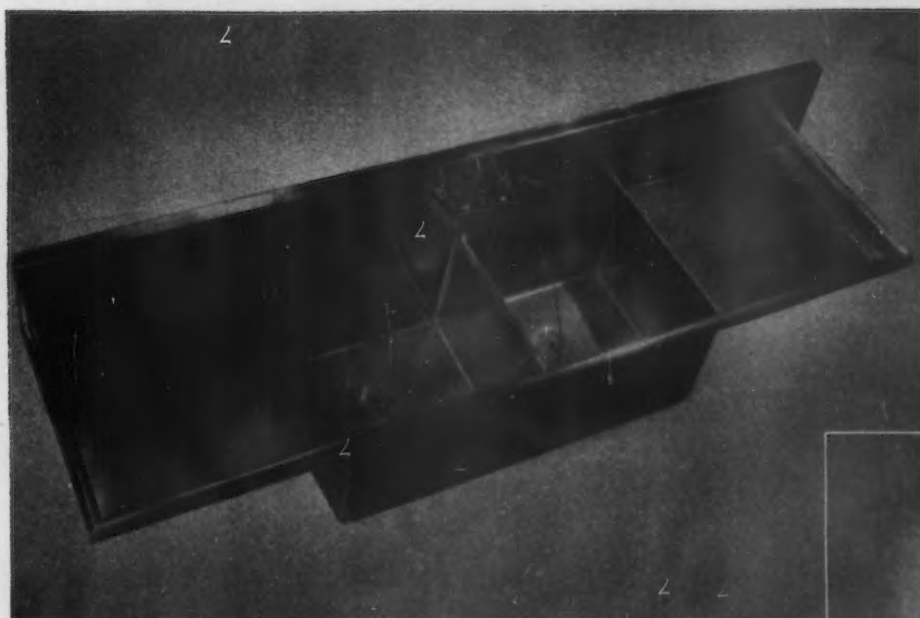








# WHY FABRICATORS LIKE TO WORK WITH "ARMCO *Stainless*"



» Sink specifications demand good fabricating qualities and flawless finish from "stainless." You can see for yourself that ARMCO STAINLESS STEELS qualify.

» Deep and sharp draws like this bring out the great ductility and toughness of ARMCO STAINLESS STEELS. It fabricates easily and surely.



» You manufacturers have made ARMCO Stainless Steels the popular bright metals they are.

You wanted sheets, strip and plates that were reasonably ductile—that would readily shear, punch, form, draw, spin, solder and weld. We gave them to you.

You wanted stainless steels of surpassingly fine finish; and we provided them in a choice of six different surfaces—one for every possible requirement.

You wanted stainless steels that would satisfy and economize for users of your products and equipment . . . Stainless steels that stubbornly resist corrosion . . . stainless steels easy to clean and keep clean . . . stainless steels absolutely non-toxic and non-contaminating . . . stainless steels that say "no!" emphatically to Old Man Replacement. And again ARMCO Stainless Steels qualify.

Almost as important, you wanted stainless steels that bore a name well and favorably known to buyers. The name, "ARMCO," nationally advertised for 21 years, is a buy-word wherever sheet metals are used.

Send your stainless steel requirements to ARMCO—for bigger cost-savings and profits. The American Rolling Mill Company, Executive Offices, Middletown, Ohio.



Behind the Armco triangle is a wealth of experience in the manufacture of special analysis iron and steel sheets and plates. Make it yours.

## ARMCO STAINLESS STEELS

SHEETS • STRIP • PLATES

THE IRON AGE, September 26, 1935—191



## WOOLFORD BUILT PICKLING TANKS ARE DEPENDABLE

Because only the most carefully selected material and experienced workmanship go into their construction.

**G. WOOLFORD WOOD TANK MFG. CO. (FACTORY DARBY, PA.) Paschall P. O., Phila., Pa.**

## Hopper Car Built of Rustless Steel

**H**ERETOFORE stainless steel has been regarded as too costly for use in freight cars, but the Rustless Iron Corp. of America, Baltimore, has developed a rustless steel, RR-11, with the purpose in view of making its use economically justified in tonnage applications.

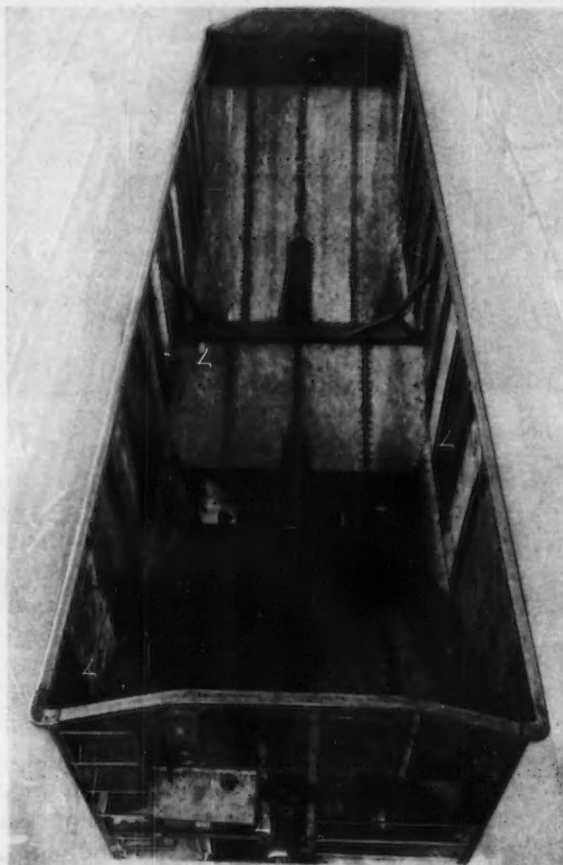
To demonstrate the adaptability of the material to railroad freight equipment a hopper car was recently built for the Rustless Iron Corp. by the Ralston Steel Car Co., Columbus, Ohio. In this car the body is constructed of RR-11.

The new rustless steel was produced especially to meet the more severe forms of corrosion, together with such other factors as abrasion, which shortens the life of rolling stock. This steel, which is made under patents of the Rustless Iron Corp. and rolled by the American Rolling Mill Co., is of a composition that may be modified to meet the requirements of varying applications. The preferred analysis, however, includes upward of 11 per

cent chromium and 0.05 to 0.07 per cent carbon. The steel may be used within a wide range of physical values from 70,000 to 150,000 lb. per sq. in. tensile strength. The following are typical values:

Ultimate tensile strength—90,000 lb. per sq. in.  
Yield point—65,000 lb. per sq. in.  
Elongation in 2 in.—15 to 25 per cent (dependent on gage).  
Hardness — 185 Brinell.  
Izod impact—90 ft. lb.

Impact resistance is termed excellent, even



down to sub-zero temperatures, but it naturally varies, dependent on tensile strength and hardness. RR-11 is stated to be readily weldable and may be worked hot or cold. In applications where ap-





# TOLEDO REVOLUTIONIZES SCALES



## HOW ALUMINUM HELPED:

This is the new Toledo Plaskon Duplex Scale.

Unlike any scale you ever saw, and it weighs about one-third as much as any of its predecessors. The very fundamentals of the design are dependent upon ingenious use of materials new to scale construction. One is Alcoa Aluminum which saved about thirty pounds for many chassis parts. Permanence of shape and dimension in these parts was a further consideration in the choice of Aluminum.

Particularly striking is the use of Alcoa Aluminum Alloy sheet for the revolving price chart. All buckling, expansion and contraction from atmospheric conditions is eliminated. The reading line can thus

be set with extremely close clearance, to make all readings always accurate. Readings are quicker because the lightness of Aluminum reduces flywheel effect.

Twice as many figures as ever before can be shown, doubling the convenience of the scale. Newly designed lenses, set in an Aluminum frame, make these accurate readings easy.

These contributions of Alcoa Aluminum came partly from the inherent advantages of its many versatile alloys; and partly from the intimate teamwork between Toledo engineers and our own staff. Possibly we can help you. ALUMINUM COMPANY OF AMERICA, 1885 Gulf Building, Pittsburgh, Pa.



# ALCOA · ALUMINUM



## BASIC ELECTRIC STEEL FORGINGS



N.F. & O. Basic Electric Steel produced under rigid metallurgical control is an important quality factor in the ultimate forged product

### BASIC ELECTRIC STEEL

Carbon, Alloy, Corrosion Resistant and Special Steels Smooth Forged, Hollow Bored, Rough or Finish Machined, Heat Treated to Specifications ... Forging Quality Ingots, Pressed or Hammered Billets.

## NATIONAL FORGE AND ORDNANCE COMPANY IRVINE, WARREN COUNTY, PENNA.

pearance is of secondary importance, as for example in hopper car sheets, the material may be used in the as-rolled condition and painting as a preservative is unnecessary. Hot-rolled sheets having a pickled finish present a good appearance. Cold-rolled sheets have a bright, dense surface.

In the construction of the hopper car no effort was made to reduce its weight by short cuts which would

in any way render operation of the car unsafe.

The car is 35 ft. 10½ in. long over strikers and has an extreme width of 10 ft. 5 in. Inside length is 35 ft., and inside width, 10 ft. 4¼ in. The load limit of the car is 135,900 lb., and the light weight, 33,100 lb. Cubic capacity, level full, is 2305 cu. ft., and with a 10-in. average heap, 2595 cu. ft. Revenue load, at 52 lb. of coal per cu. ft., is placed at 134,000 lb.

Thicknesses of the high-tensile

RR-11 sheets used in the hopper car body are as follows:

Side sheets and end sheets—3/32 in.  
Floors and cross ridge—¼ in.  
Hopper sides, inside—¼ in.  
Hopper sides, outside—¼ and 3/16 in.  
Doors—5/32 in.  
Stakes, pressed—¼ and ¼ in.  
Floor stiffeners—5/32 and 3/16 in.  
End stiffeners—3/16 in.

The hopper door frames, the center sill, the body bolsters, the crossbearers and crossbearer arms are steel castings.

Wheels are of single-wear rolled steel made to A.A.R. specification.

## Two New Beer Cans Enter the Field

TWO new beer cans have been introduced to vie for public favor with the can recently brought out by the American Can Co. The

Co. is producing beer cans at its Baltimore plant for the Northampton Brewery Corp., Northampton, Pa., and for the Red Top Brewery Co., Cincinnati. Additional manufacturing facilities at that plant as well as at the com-



new cans have the same capacity (12 fluid ounces) as the American can and, like it, are made of tin plate with a special lining. One of the cans, produced by the National Can Co., a subsidiary of the McKeesport Tin Plate Co., is identical in appearance with the American can and is provided with a special opener. The other, developed by the Continental Can Co., has a conical-shaped top, is sealed with a cap and is opened like a bottle.

The Continental Can Co. is making its new cans at its Chicago plant and will commence deliveries to breweries some time this month. The National Can



pany's other plants are planned to take care of the growing demand for this type of container.

The Empire Sheet & Tin Plate Co., Mansfield, Ohio, has issued the first number of "The Empire Sheet," an eight-page publication devoted to special uses of sheet steel. The first issue contains interesting contributions on the application of electrical sheets, enameling stock and other products.





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# JUST BETWEEN US TWO

## Bad Case of Conjunctivitis

FOR years we have been wasting the company's good money, trying to get a certain Illinois plant to subscribe for The Iron Age. And now this letter comes in:

*"I am just a watch man in this plant it is not working for years and the place is cloused and I think they will never open up for it is in bad shape for all the equipment is took out and they might tore it down, that is all I can say."*

*Yours truly,*

*John."*

This is a good John. With much travail, he enabled us to take a dead name off our list. But most Johns won't take the trouble, and we don't blame them, which is why people who handle mailing lists get bald young and eventually begin talking to themselves.

## Salute

YOU can almost pick the cap screws off the page in that Cleveland Cap Screw ad on page 79 of the Sept. 12 Iron Age. A beautiful example of what expertness and painstaking care can do with halftone illustrations.

## We Hope It's Pleasant

ASWEDISH manufacturer writes:

*"Will you please send us a couple of the last editions of Iron Age, as we probably are going to prenumerate of The Iron Age in future."*

Anything for a new sensation.

## Prosperity Symbols

EVERYWHERE we go we hear that business is improving rapidly. Machine tools were sold hand over fist at the Cleveland show last week. Advertising is increasing; so is circulation. A Brooklyn forging manufacturer says there is a shortage of good forging blacksmiths, and bad ones, too. It must be more than mere talk. The first thing you know someone will be getting a salary increase.

## Problem

ALTHOUGH too much for our feeble mind, this may be child's play for yours:

*Two ladders, one 20 feet long and the other 30 feet, lean diagonally in opposite directions across an alley. They cross at a point 15 feet above the alley. The alley is how wide?*

The pig and hog feed man knows the answer.

## Even Though It Hurts

EDITORS probably wouldn't like it if too many people said they find the advertisements as engrossing as the editorial contents. But letters like this, from the vice-president of a big drapery hardware manufacturing plant, are not rare:

*"I might go so far as to say that frequently when time did not permit reading both the articles in The Iron Age and the advertising, I believe nine times out of ten the advertising came first, as I felt that this was a quick way of keeping abreast with the times and in touch with the new things being advertised thru this medium."*

## Twelve Hairs Stood on End

LIKE all good papers, The Iron Age is a member of the Audit Bureau of Circulations. The A.B.C. sends an auditor here every year to go through our circulation records, to see that we are strictly honest and moderately careful. Although our conscience is clear, we are always afraid the auditor will find something terrible.

This year he said "Your renewal percentage figure is wrong." We shivered, for this is the thing which we have been doing so much bragging about. We had reported 11,251 expirations, 9,355 renewals—83.15 per cent. The auditor found that the correct figures are, 11,254 expirations, 9,355 renewals—83.11 per cent.

## Invitation

OUR booth at the National Metal Exposition, opening in Chicago on Monday, is No. F-23. Make yourself at home.

—A.H.D.

NEVERSLIP

## Rolled Steel FLOOR PLATES

Proved by over 35 Years' use, in all lines of Industry

The exclusive sharp-edged, flat-topped Diamond projections assure safe footing from any direction, plus an even trucking surface. The manner in which the Diamonds are arranged permits unobstructed drainage and ease of cleaning.

Due to a "special process" of manufacture, NEVERSLIP PLATES give longer service life.

*Write for Literature*

**American Pressed Steel Co.**

Commercial Trust Building  
Philadelphia, Pa.

## Cone 4-Spindle Automatics

Are economical and accurate producers of screw machine parts up to 6" diameter, 7" milling length. They cut costs, increase production, boost profits.

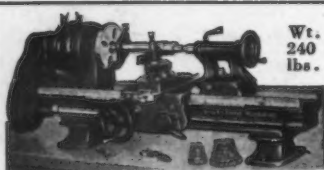
*Write for particulars*

**CONE AUTOMATIC MACHINE CO., Inc.**  
WINDSOR, VERMONT

### REPRESENTATIVES:

**Detroit:** J. C. Austerberry's Sons, 634 E. Congress St., Detroit, Mich.  
**Chicago:** John H. Glover, 2127 North Sayre Ave., Chicago, Ill.  
**Ohio:** S. B. Martin, 1077 Erie Cliff Drive, Lakewood, Ohio.  
**New England:** Potter & Johnston Machine Co., Pawtucket, R. I.  
**Indiana:** G. A. Richey, Chamber of Commerce Bldg., Indianapolis, Ind.

**New York State:** Syracuse Supply Co., Syracuse, N. Y.; also Rochester, N. Y.  
**Pennsylvania:** Arch Machinery Co., 1905 Park Bldg., Pittsburgh, Pa.  
**Philadelphia:** Lloyd & Arms, Inc., 133 South 36th St., Philadelphia, Pa.  
**California:** C. F. Bulotti Machinery Co., 829-831 Folsom St., San Francisco, Calif.



Wt.  
240  
lbs.

### SOUTH BEND LATHES

96 other sizes and types of Back-Geared Screw Cutting Lathes from 9" to 18" swing, \$75 to \$1500, on terms if desired, shown in new General Catalog No. 94. Write for copy.

**South Bend Lathe Works**  
594 E. Madison St.,  
South Bend, Indiana, U. S. A.

9"x3' Back-Geared, Screw Cutting \$75  
"Workshop" Bench Lathe.....

## LELAND-GIFFORD COMPANY

Worcester, Mass.

Drilling Machinery  
Belt and Motor Spindle  
One to Six Spindles

Tapping Attachments and Multiple Heads

17 STYLES AND SIZES  
**MERRELL**  
PIPE THREADING for BETTER threads MACHINES  
TOLEDO, OHIO

## ABRASIVE SURFACE GRINDER

Either Horizontal or  
Vertical Spindle  
Type  
Countershaft or  
Motor Drive

*Get our bulletin for particulars*

ABRASIVE MACHINE TOOL CO., East Providence, R.I.

## "LUCAS PRECISION"

Horizontal Boring, Drilling and Milling Machine

**THE LUCAS MACHINE TOOL CO.**



CLEVELAND,  
OHIO, U. S. A.

## GET IN THE HABIT

*of reading and using the  
classified sections—they  
are full of opportunities.*



## THE ATHENIA STEEL CO.

135 William Street, New York

Works, Athenia N. J.

Makers of High Grade Tempered and Polished Steel for Clock, Watch, Motor and Typewriter Springs. Also Wound Springs. Tempered and Untempered Steel for other purposes. Special quality equal to finest imported for finish and accurate rolling. Also Stainless Steels of various grades.

### AGENTS—

Lapham Hickey Co.—3333 W. 47th Place, Chicago, Ill.—414 United Artists Bldg., Detroit, Mich.  
The Hamilton Steel Co.—East 131st Street and Taft Ave., Cleveland, Ohio.  
E. F. Krause & Co.—817 Yale Street, Los Angeles, Calif.  
Hill Chase & Co.—Richmond and Ontario Sts., Philadelphia, Pa.  
Wetherell Bros. Co.—251 Albany St., Cambridge, Mass.

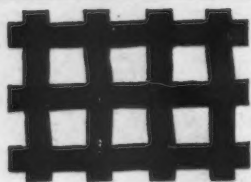
TRACK SPIKES  
BOAT SPIKES  
DOCK SPIKES  
GUARD SPIKES  
TRACK BOLTS

STEEL BARS  
IRON  
DEFORMED REINFORCING

**W. AMES & CO.**

ESTABLISHED 1864  
ROLLING MILL FACTORY  
JERSEY CITY, N. J.  
WAREHOUSE OFFICE

MACHINE BOLTS  
TIE RODS  
WASHERS  
SPICE BARS  
RIVETS—NUTS



## MICHIGAN WIRE CLOTH CO.

ESTABLISHED 1864

EVERYTHING IN WIRE CLOTH

Pioneers in the manufacture of DOUBLE CRIMP WIRE CLOTH and WIRE SCREENING of every kind possible to weave, made of Steel, Iron, Brass, Copper, Bronze, Aluminum, German Silver, Pure Nickel, Galvanized, Tinned, Monel, Manganese, Zinc and Stainless Steel; also Wire Lath, etc.  
Also drawers of Brass, Copper, Bronze, German Silver, Pure Nickel, Aluminum, Monel Metal, Wire, etc.  
2117 HOWARD STREET, DETROIT, MICH.  
Write for Catalogue No. 25

## Maybe it's in the CLASSIFIED SECTIONS

If you can't find it in the regular advertising pages of The Iron Age—look in the Classified Sections at the back of this book.

**THE CLASSIFIED SECTIONS of THE IRON AGE**



